

MOTOR AGE

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CHICAGO, JUNE 13, 1918

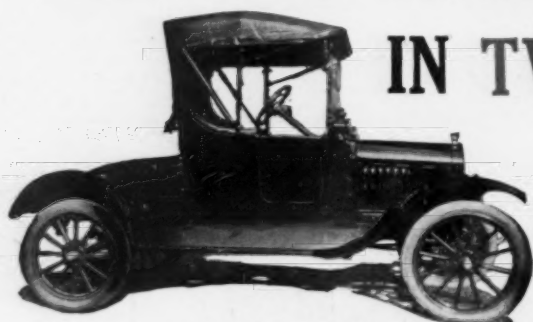
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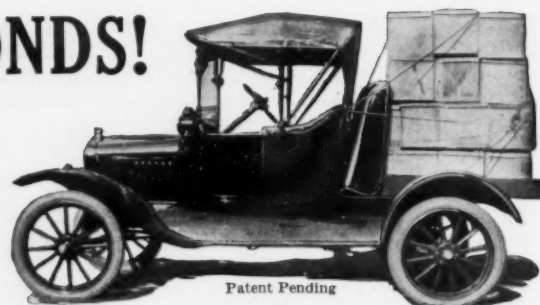


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NOTICE

For a second time MOTOR AGE is late in reaching its readers on account of a strike of the Chicago press feeders and again asks its readers' forbearance.

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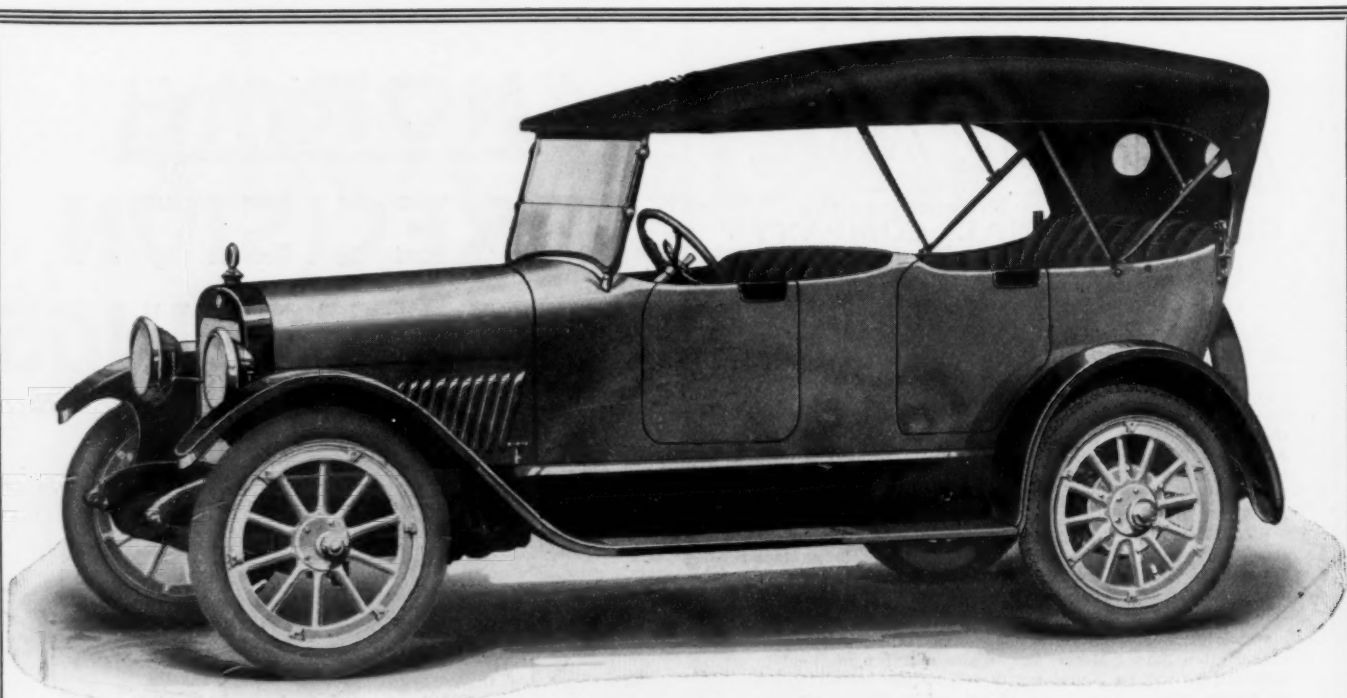


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Read the synopsis of Elcar specifications—remember that this car is built by an organization schooled in building cars to sell at \$3,000 and up—and you will begin to realize the great value of the Elcar at its present prices.

The Elcar will fill your every desire. It is powerful, speedy

and very responsive. It is saving of gas and oil. Eighteen to twenty-four miles are averaged to a gallon of gasoline, a thousand miles to a gallon of oil—while tire mileage runs exceedingly long.

Find out at once if you can get an Elcar. Naturally the demand is heavy—our production has been curtailed—some dealers have had their year's allotment sold for a long time.

We suggest that you see your dealer without delay.

CATALOG ON REQUEST. Gives full information regarding the 1918 Elcar model. Gladly mailed to anyone interested. We will also send the name of nearest dealer if you don't know him.

ELKHART CARRIAGE & MOTOR CAR CO.

C-781 Beardsley Ave.
ELKHART, IND.



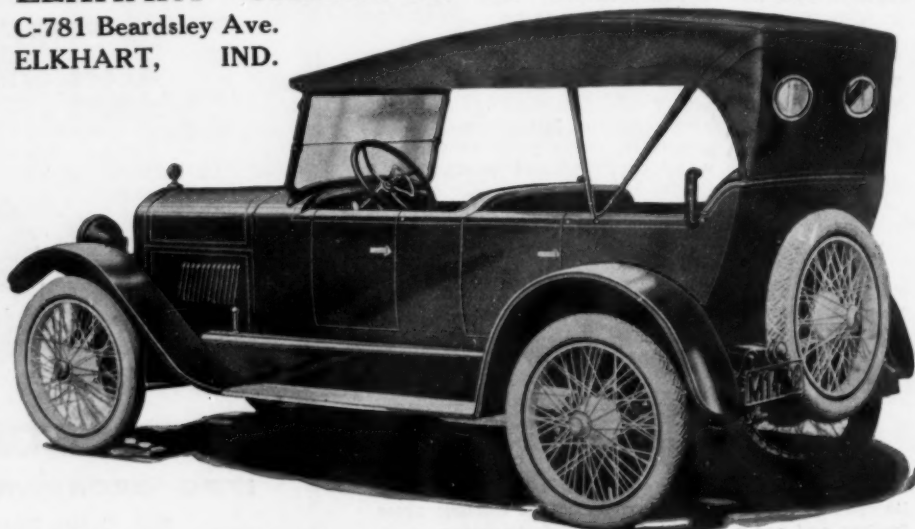
ELCAR Specifications in Brief:

Four-cylinder models have powerful long stroke Elcar-Lycoming motor, developing 37½ horsepower at 2,100 r.p.m. Six-cylinder models have famous Continental 3¼x4½ inch engine, developing 40 horsepower at 2,100 r.p.m. Outside of the power plants, the Elcar sixes and fours are practically the same. Two unit electrical system. Long wheel base, 116 inches; road clearance, 10½ inches. Full floating rear axle with spiral bevel driving gears. Timken Roller Bearings front and rear. Double universal drive; tubular propeller shaft. Copper cellular radiators.

A wonderfully easy riding semi-elliptic spring suspension. Roomy and comfortable bodies of beautiful design and durable finish; new "Cathedral Pipe" upholstery. Equipment complete, even to motometer on radiator.

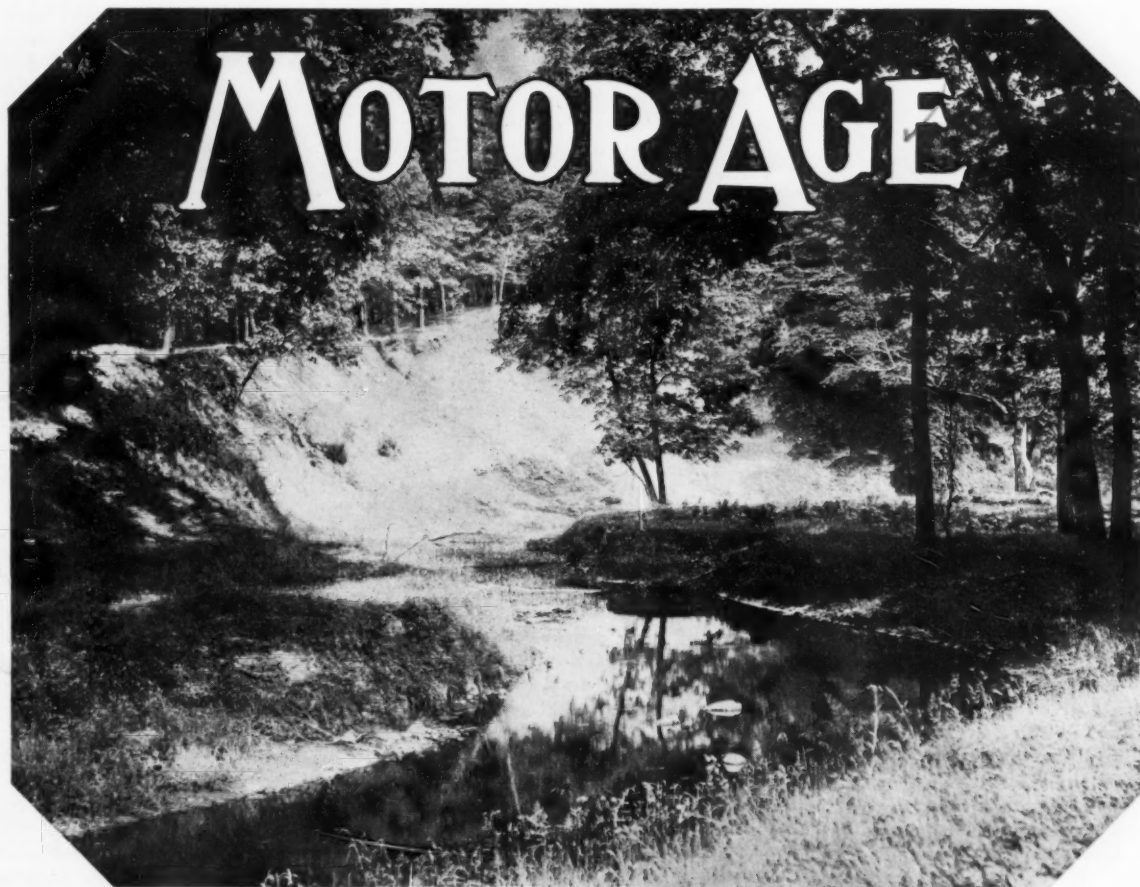
Elcar Four-Cylinder Touring Car and Roadster...\$1095

Elcar Six—Touring Car and Roadster\$1375



New Elcar Sportster Model. \$1,175 with Four Cylinder Power Plant and \$1,375 with Six Cylinder Power Plant

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Creek in Cook County forest preserve southwest of Chicago

A Mecca for the Motorist

THE idea of utilizing the nearby attractions as Chicago and Cook county are doing is one that any city or town could promote with benefit to all within its limits, as well as passing motorists. The forest preserves of Cook county in no way are free camping sites for motorists; their character is broader and wider in scope. But for these war times, when motoring necessarily will be in a more circumscribed area about the place in which the motorist lives, the same facilities of open air living, with added advantages of being close to business for the members of the family who may work and for those engaged in war relief activities, are offered.

The town or city which has no stretches which offer themselves as motoring meccas similar to the forest preserves is a very poor town indeed, and a rare town. The grove up on the river, the 3-mile creek, the hollow, Smith's pond, Farmer Brown's woods lot—all these are at heart forest preserves in miniature and motorists' meccas in the large.

The same idea lies in a camp in the woods within motoring

distance of the office at which some member of the family must be. Such a camp can be maintained in almost any locality at small expense. If there are no public grounds, such, for instance, as are used for picnics given by the various Sunday schools and others, the use of private grounds can be obtained for the asking from farmers with certain precautions on the parts of the motorists using them. The persons asking the use should agree to keep the grounds clean, to keep fires from spreading and to fasten all gates so stock cannot stray. Where a ground rent is charged, it usually is not high and usually includes wood and water.

The development of nearby motorists' meccas is a project which a motor club well could take on. Given ground spacious enough for the scattering of parties, such as is the case with the forest preserves mentioned here, a family with a car can take its summer vacation with all the privacy of home without losing any time from necessary business or war work. Individual motorists also would do well to look into local possibilities.—Editor.

EVEN as a prophet is not without honor save in his own country, so the attractions of places close to home are often unknown to people who spend much time and money exploring landscapes hundreds, even thousands of miles from their hearths. Many are more familiar with Colorado, California or Florida than they are with the natural beauties very near to the town in which they live.

It renews one's optimistic opinion of human nature to learn that quietly the county of Cook, in Northeastern Illinois,

By Avis Gordon Vestal

has been acquiring large tracts of rolling land, most of them near streams, covered with full-grown native timber. These are to be maintained in their natural condition and made refuges for birds and many forms of attractive native fauna and flora. Already they have been opened for the health and pleasure of the several millions of weary humans in the windy metropolis, its dozens of suburbs and the outlying

towns and farms of Cook and adjoining counties. The far-sighted plan embraces the future public ownership and free use of many thousands of acres of woodland, which will form a natural outer park girdle circling Chicago interruptedly on three sides.

The first of these forests of hardwood to be dedicated was Deer Grove, a little beyond the town of Palatine, in the extreme northwestern corner of Cook county. About 5000 persons witnessed the services and enjoyed a day of sports in June, 1917. The



Twenty-five-acre lake in Deer Grove forest preserve

first of many scattered purchases was made in the autumn of 1916, while by January, 1918, 9393 acres were owned or contracted for, at a total cost of \$3,475,946. Additions are being made this year, bringing the total area up to about 12,000 acres. The accompanying map indicates the whole scope of the proposed preserves, with roads marked in for reaching the most desirable of the groves already available for excursions.

Tracts Are Signposted

As rapidly as possible after they are acquired the forests are being marked with painted placards facing the roads along their margins. Nearly all the tracts now owned are thus signposted and the remaining ones, among them the Palos preserve, will be labeled soon.

Unusual conditions due to the war will keep at home many families that in previous seasons have been free to venture afar. Some men have had their business so depleted by war times that the usual finances are not forthcoming for a long trip. Other business and professional men have had their incomes increased by the same things, but their responsibilities have also so grown that, though the money is at hand, they cannot have the usual freedom from the office for several weeks. To these people the groves will offer many compensations for giving up the customary longer trips.

A camp outfit, once purchased, will serve for several seasons. Individuals or single families may go informally to the preserves for a night or two, notifying the caretaker, who usually lives in a nearby farm house purchased with the lands and who will supply water if needed, though some of the groves have springs or wells or even city water piped to them. Some of the groves already have sanitary comfort stations, and others are to be built this summer. Several rain shelters also are to be constructed. Dry wood lying on the ground is available for cooking, with proper care against the spreading of the fire. If a larger party wishes the use of grounds, or if a family plans to stay quite a while, it is preferred that a permit be obtained from the head-

quarters of the preserve in the County Building, Washington and Clark streets, Chicago. There is no fee and no restrictions save those of moral conduct and protection of the public property, but knowledge in advance of camping intentions will allow the commissioners to scatter the parties so that no several large groups shall be using the same grounds on the same days.

In the spring the ground in the groves is a wonderful mosaic carpet of colors skillfully blended by the great artist, Nature. In season visitors can find violets, Dutchman's breeches, may apples, false Solomon's seal, Jacob's ladder, wild geranium, sweet Williams, jack-in-the-pulpits, adder's tongue, anemones, trilliums, columbines, spring beauties and dozens of other species. The squirrels are fearless, as all wild creatures are protected. At Deer Grove are some beautiful pheasants, and several pairs of quail have been purchased to restock the grounds. The birds are on the increase, and the bluebird, the shy thrush and the

indigo bunting are among scores of birds worth studying. Since the creation of an artificial lake of about 25 acres at Deer Grove many water birds have been attracted. Among the trees, many of them splendidly developed open-grown specimens, such as symmetrical hard maples and spreading, urn-shaped elms, are oaks of several varieties, lindens, hickories and hawthorns. Evergreens are not native, but the conditions for their growth are favorable and the chief forester, Ransom Kennicott, has planted some thousands of young pines, spruces, firs and other conifers upon some of the open lands.

As war times demand extra efforts in food and wool production the preserves are doing their bit. About 500 sheep were purchased last year and are grazing at Deer Grove and are soon to be sheared. Over 2000 cattle are grazing in some of the groves and about 500 acres are planted to grains.

In practically all cases hard roads, at least to the margins, obviate fear of rain.



Family group at Northwestern Park, another Cook County forest preserve

Outside the city are some excellent, smooth, paved roads, such as Milwaukee avenue from the city limits out to Wheeling. In many instances, it must be admitted, stretches of gravel or macadam, with a contour like a paving of washbowls, try the patience, but they keep a car out of the mud of the primeval swamp, at least, and they are soon covered. As only a short time is spent on these on the way to the more distant preserves, the restfulness of the groves is worth the effort. Thatcher's Grove is one of several reached all the way over good paving.

The tract nearest to Lake Michigan is Turnbull Woods, at the north margin of the county, west of Glencoe. Sheridan road leads north to a point a little east of it, while the Green Bay road penetrates it.

The northwestern section has already many tracts opened. At Forest Glen, within the city, the banks of the north branch of the Chicago river bear a bevy of signs facing winding Forest Glen avenue, which motorists can reach from the east via Petersen avenue, which connects with it. Or, the diagonal, Lincoln avenue, may be followed to its junction with Petersen avenue, at which point both of these roads are well paved, though westward the surfacing is fair. Another route is to ride west on paved Lawrence avenue, north a few blocks on bumpy LeClaire avenue, which is being resurfaced, entering Forest Glen avenue from the south.

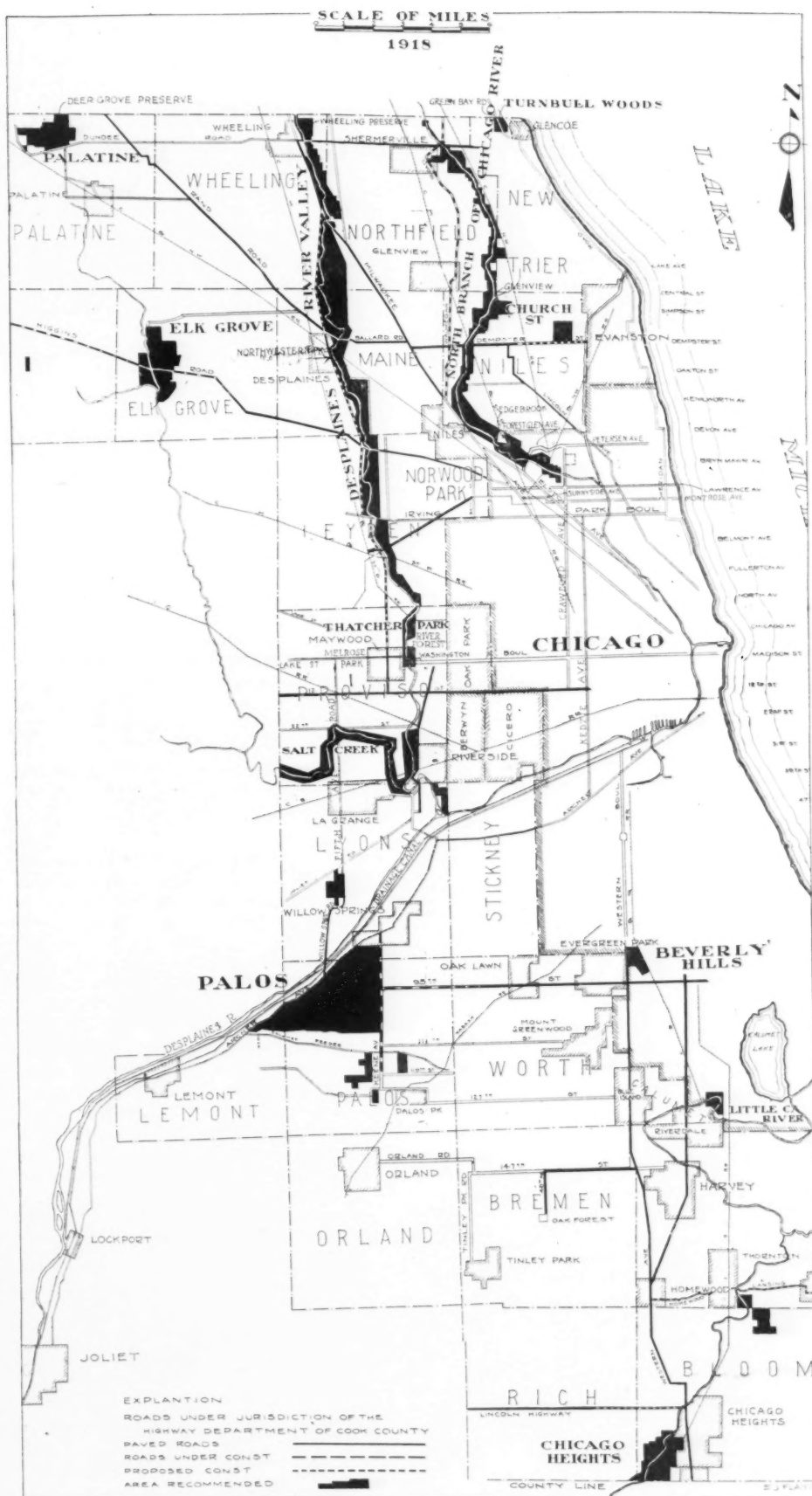
On Paved Road

From Forest Glen the extension of Elston avenue to connect with Milwaukee avenue is paved. The first road to the right, after leaving Forest Glen, is a rutted, poor gravel road, very short, leading to Edgebrook, also on the north branch of the Chicago and within the city limits. Beyond this little settlement an earth road goes into the woods of another small preserve.

Milwaukee avenue leads to several preserves, the first being at the city limits, at Niles. It is on the banks of the north branch of the Chicago river. From this point out to the town of Wheeling signs of the preserves will be met at irregular intervals, being most numerous from the crossing of Milwaukee avenue with the Des Plaines river and continuing out to Wheeling. A very attractive place is on the Dundee road, about $\frac{1}{4}$ -mile east of its junction with Milwaukee avenue, where the paving of Milwaukee avenue ends. The little distance to the park entrance is being surfaced, also. The improvements here are a well, comfort stations and a gravel road leading in for the parking of cars.

From the end of the paving at Wheeling a trip west on this same Dundee road, instead of east, will bring the motorist to the very extensive Deer Grove, north of Palatine. On the west of this road is the lake, not in view from the road, but large enough for boating.

Other routes to Deer Grove are Milwaukee avenue to the Ballard road, thence west to Rand road, thence northwest until it crosses the Dundee road; or, leave Milwaukee avenue at the sign "To Palatine," riding west over bumpy roads to that town, thence north and west or west and north, as preferred.



Map of forest preserves in Cook county, with roads to them

At the city of Des Plaines, on the bank of the river of the same name, is a preserve called Northwestern Park. A road branches west from Milwaukee avenue to the town. Several miles west of the town is Elk Grove, a rather level and low-lying pre-

serve, less attractive than some others. From Des Plaines take the first westward road branching from the Rand road north of the town.

A most delightful and very accessible
(Concluded on page 47)

Effect of Steel Control

Motor Car Industry Will Receive Pro-Rata Divisions After War Needs Are Met Through Agreement with the War Industries Board — Work in Selected List

WASHINGTON, June 7—The motor car industry will not suffer complete curtailment of pig iron and steel shipments through the agreement of the War Industries Board and the American Iron and Steel Institute. The agreement means briefly that:

For the time being passenger car and commercial truck makers will receive pro rata divisions of the steel remaining after war needs are met.

The United States Government and its allies will be assured of all the steel they require for war work.

Every steel and pig iron shipment in this country will have the approval of J. Leonard Replogle as director of steel products.

There is a possibility in some instances for classification of passenger cars and trucks engaged in special work in higher divisions of the selected list, insuring them full steel needs.

For several months steel makers have been giving priorities on shipments to war industries, diverting 80 per cent to war work, dividing the remainder with non-war industries. Practically this percentage, according to the War Industries Board, will be maintained. The agreement, however, raises a question as to the status of motor trucks and passenger cars in the selected list of steel consumer. Definite decisions will be made on individual uses of passenger cars and motor trucks as the cases arise.

Takes Control Away

The agreement places control of pig iron and steel shipments under the War Industries Board, taking it from private manufacturers, and specifies a selected list of steel consumers, as follows:

SHIPS, including destroyers and submarine chasers.

AIRCRAFT.

MUNITIONS, military and naval supplies and operations—building construction for Government needs and equipment for same.

FUEL for domestic consumption. Manufacturing necessities named herein. Foodstuffs for human consumption and plants handling same. Feeding stuffs for domestic fowls and animals and plants handling same.

Food and collateral industries. All tools, utensils, implements, machinery and equipment required for production, harvesting, distribution, milling, preparing, canning and refining foods and feeds, such as seeds of foods and feeds, binder twine, etc. Products of collateral industries, such as fertilizer, fertilizer ingredients, insecticides and fungicides. Containers for foods and feeds, collateral products. Materials and equipment for preservation and other refrigeration supplies, including ice.

CLOTHING for civilian population.

RAILROAD or other necessary transportation equipment, including water transportation.

PUBLIC UTILITIES serving war industries, Army, Navy and civilian population.

The agreement further creates a system of priorities for steel shipments. It stipulates shipment of steel and pig iron to non-war industries only after every need of the preferred schedule has been cared

for under certified priority orders or by written permission of the steel director after formal application.

The chief object of the agreement, according to Bernard M. Baruch, is to check up all steel and pig iron shipments, and insure ample supply for the war needs of the United States and its allies. It has a secondary object of guaranteeing equitable division of the steel, remaining above the war requirements, to each individual manufacturer, large or small, not engaged in war work. It was stated to-day that many manufacturers have complained of favoritism in steel shipments to their larger competitors by the steel makers. The license system of the new agreement is expected to provide pro-rata division of the remaining steel to all manufacturers large or small in non-war industries.

Motor trucks for Army distribution will come under the third class, munitions. Commercial trucks used directly for important transportation will enter into the seventh class, necessary transportation equipments. The status of motor truck and passenger cars generally, however, is not definitely decided.

Trucks Necessary?

In answer to the question: "Will motor trucks used for rural motor express and return loads be classified as necessary transportation equipment?" the reply was:

"The status of motor trucks is not definitely fixed, but if this work is not mere camouflage, they may be classed as necessary transportation equipment," showing that the War Industries Board is not aware of the very important motor truck work stimulated by the Highways Transport Committee or of the fact that the Railroad Administration counts the motor truck so important it is considering the establishment of a National motor truck transportation system.

Passenger cars are not regarded highly by the War Industries Board. Discussion

of them invariably took on the aspect of a good joke. During the interview the industry was called an unpleasant subject. One of the highest officials was questioned:

"The Fuel Administration, last winter, classified passenger cars as public utilities in its five-day shut-down order. Will you class passenger cars as public utilities and place them in the eighth division of your selected list?"

He replied that he was not the priority man, but that "pleasure cars" would not come high on the list with him if he were. The term "pleasure cars" is used constantly by every official of the War Industries Board, despite the fact that others addressing them use the term "passenger cars."

When told of the great national interest taken in the possible curtailment of the passenger car industry members of the board intimated that it was due to the fact that passenger car makers are "big advertisers."

Voluntary Efforts End

The agreement reached between the War Industries Board and the American Iron and Steel Institute marks the abandonment of the board's efforts to deal through voluntary arrangements with individual industries. It marks also a clear disagreement between the War Industries Board and steel manufacturers. The War Industries Board claims a serious shortage of steel exists. For months they have held conferences with the motor car, steel and other industries, demanding curtailment. The steel makers and other industries maintained that there is a sufficient supply of steel. Very recently they asked the Government for a budget of the steel requirements, claiming they could meet it if they knew what demands to anticipate. The budget has not been forthcoming. The control of steel was assumed by the Government, because, the War Industries Board states, it is impossible to create a budget of the steel requirements owing to

NOTICE TO READERS

FOR the second week in succession MOTOR AGE reaches its readers much later than is its custom. The delay is due to a strike of the press feeders in Chicago, which prevents its being printed at the scheduled time. Every effort has been made to get the issue to you sooner, and undoubtedly succeeding issues will reach you without delay.

the rapid daily changes in the size of orders by the Allied nations and the Government.

Newspaper dispatches stating that the motor car industry will not receive any steel or pig iron, were declared erroneous by both Mr. Replogle and Mr. Baruch today. They stated that it will share equitably with all other non-war industries where it can prove direct or indirect war work, when it will be placed on the selected list.

Newspaper dispatches to the effect that orders for 17,000,000 tons of steel are unfilled on the books of steel makers are misleading. These orders are in the main for future delivery, which the newspaper dispatches failed to state.

A survey is being made of the steel industry and of the war and non-war requirements, according to Mr. Replogle, which will be used as a basis for increasing steel production. Mr. Replogle added further that the new agreement will not be completely rigid. It will be sufficiently elastic, so that, for example, if a large motor car company has 90 per cent of the materials on hand and needs steel to complete its inventory so that it can produce, the War Industries Board would not raise an obstacle by its priority system.

It was admitted, in the interview, that the limiting factor in the steel and pig iron industry is not steel but pig iron and that the limiting factor for pig iron is coke.

PATENT DECISION FOR BENDIX

Washington, June 7—The United States Patent Office decision to the effect that Vincent Bendix is the first and original inventor of all the features and improvements which have made the Eclipse Bendix starter drive the practical and commercial success that it now is, reported in *MOTOR AGE* of last week, is an outcome of a series of interference cases in the Patent Office in which interference suits were instituted by the Bijur Motor Lighting Co., the Westinghouse Motor Electric Mfg. Co., and the Northeast Electric Co. Under the decision the claims of these concerns for priority of invention are not sustained, the decision being to the effect that

they are not entitled to patents on the features claimed.

The decision not only sustains the Bendix patents but deprives Bijur, Westinghouse and Northeast of the right to employ in their devices the construction covered in the Bendix patent.

For several years the manufacture of the Bendix drive has been carried on by the Eclipse Machine Co., and the sale of it handled by Brandenburg & Co. Hundreds of thousands of this device have been built to date. During the last year, Bijur has been manufacturing a device which under these decisions would be considered an infringing device. Westinghouse and Northeast have not manufactured any device to date but have been purchasing the Eclipse-Bendix drive.

Five broad interference suits have entered into this case in the Patent Office and the points broadly covered are as follows, in each of which case Vincent Bendix has been awarded priority of invention of the subject matter in issue:

1—One interference related to the use of a counterbalance pinion which was needed to cause the pinion to travel along the threaded shaft so as to engage with the tooth and the flywheel.

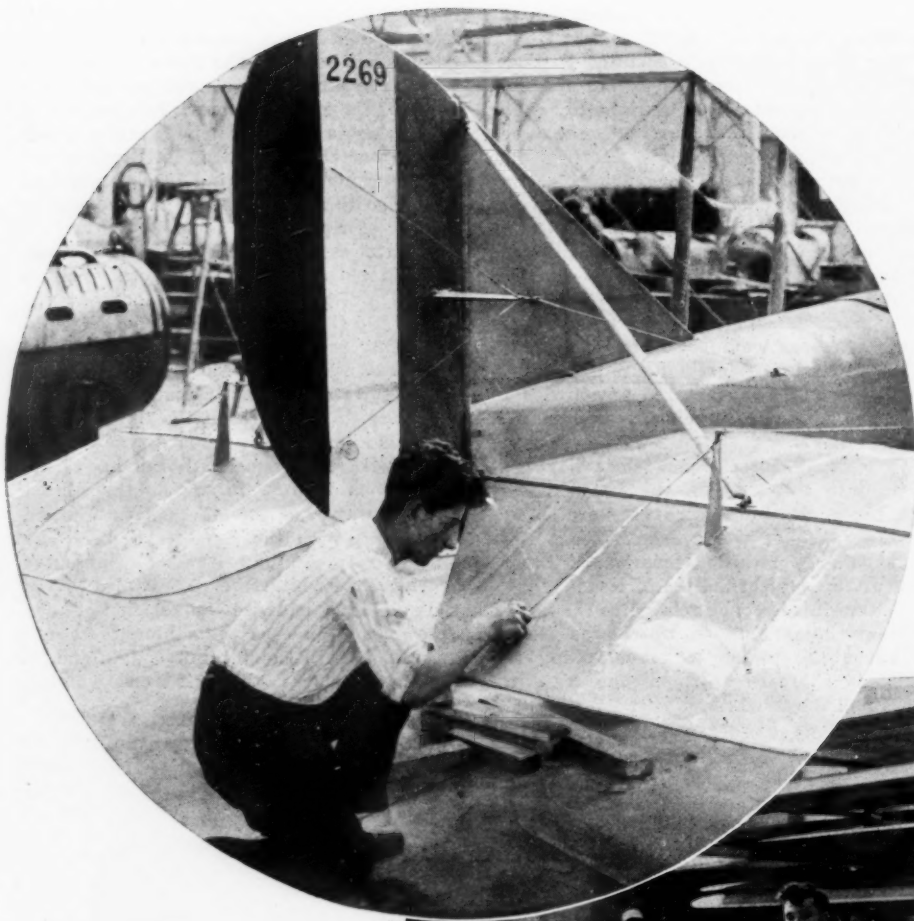
2—The second interference case covers the use of a spring for a form of yielding connection between the threaded shaft on which the pinion travels and the armature shaft of the starting motor. The purpose of the spring is to relieve the starting shock on the battery as well as on the mechanical construction entering into the device.

3—The third interference suit relates to the use of right angle stops on the threaded shaft carrying the traveling pinion, these stops being used to prevent binding of the pinion on the screw shaft at the end of the threads.

4—The fourth interference suit relates to that design in which the traveling pinion moves toward the starting motor when engaging with the teeth on the flywheel and which is known as the inboard type as compared with the opposite design known as the outboard type, in which the pinion travels away from the starting motor when it engages with the flywheel teeth. The inboard type eliminates the use of an outer bearing. This interference suit also covers the yielding endwise movement of the screw shaft in case the pinion teeth and flywheel teeth should abut end to end, before engagement. There is a companion interference on this point.



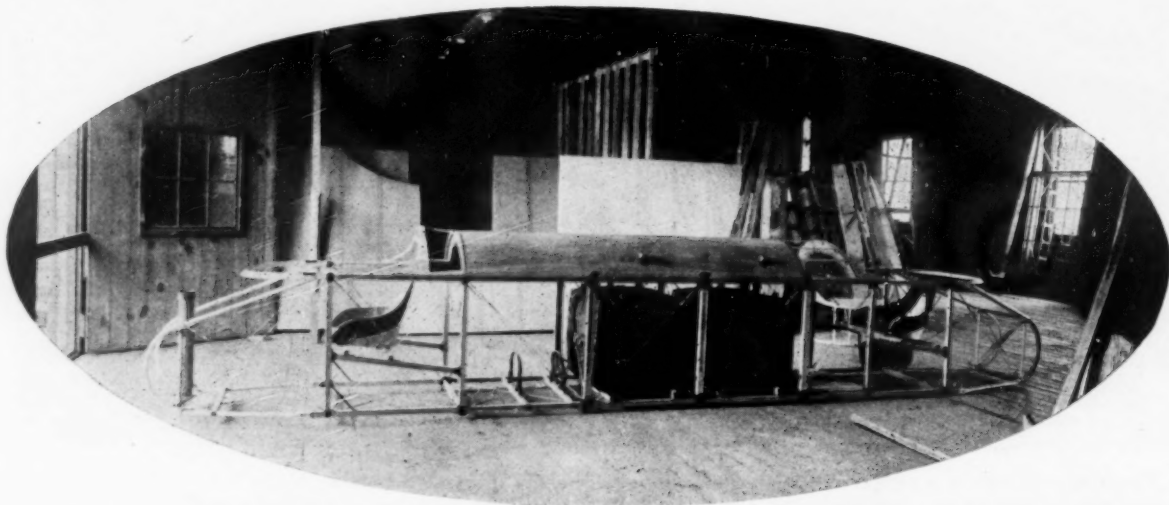
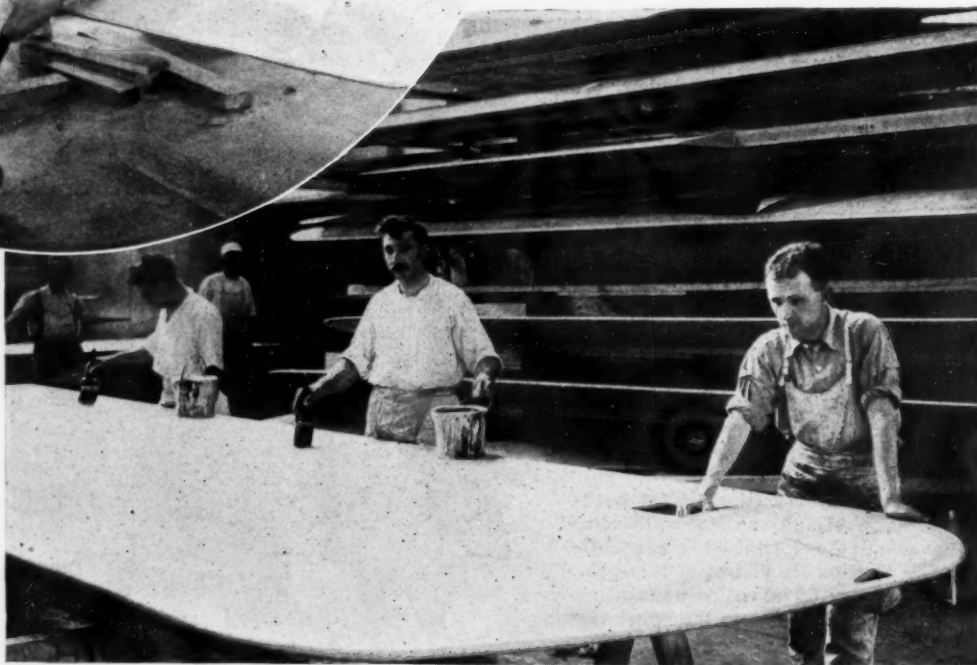
These three views of a captured German tank appeared in the *Illustrated London News* and are the first to be received in this country. Note the shallow creeping attachment



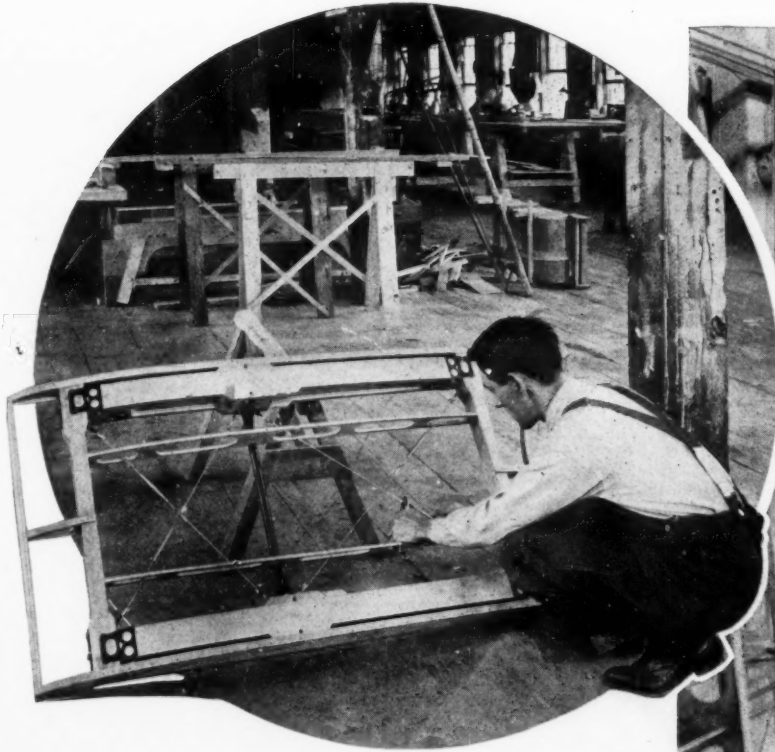
Wartime Scenes from a U. S. A. Airplane Factory

In the paint shop where the wings receive their final coatings of celluloid varnish or whatever other finish is given them during the preparation

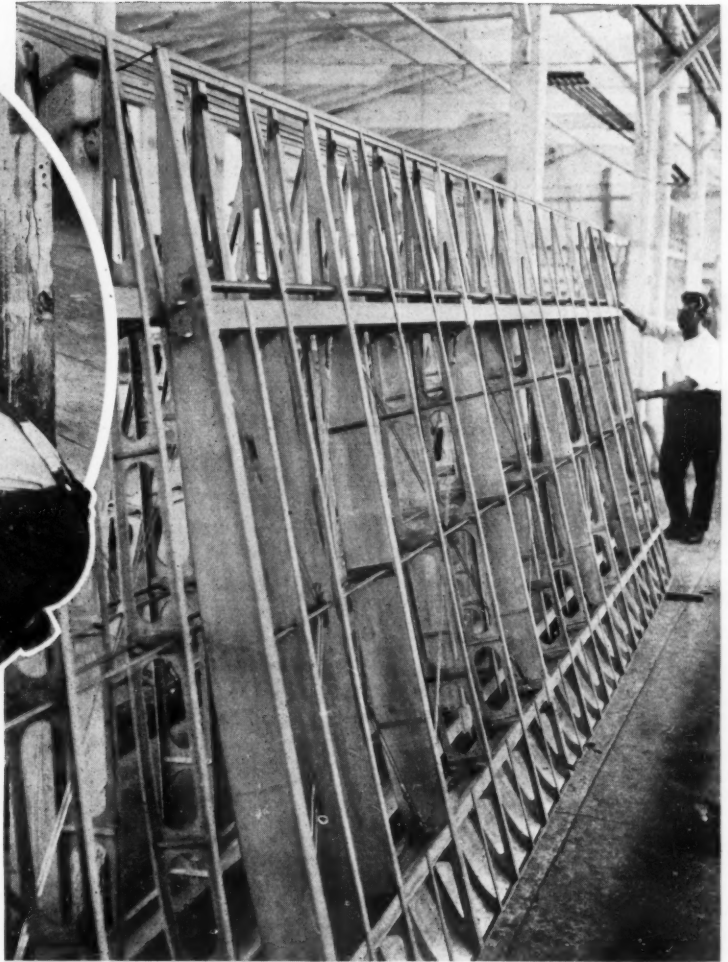
The control of the airplane rests with the vertical rudder at the rear and also the two horizontal planes which are raised and lowered to give changes in altitude. Both of these parts are worked from the stick control of the modern machines. The stick is a simple vertical handle. When you move it forward or backward a few inches it raises or lowers the horizontal elevating planes, one of which the workman alone is engaged upon. Moving the handle right or left moves the rudder, which in this case is painted with red, white and blue stripes. The stick control is not much larger than the gearset control of a motor car



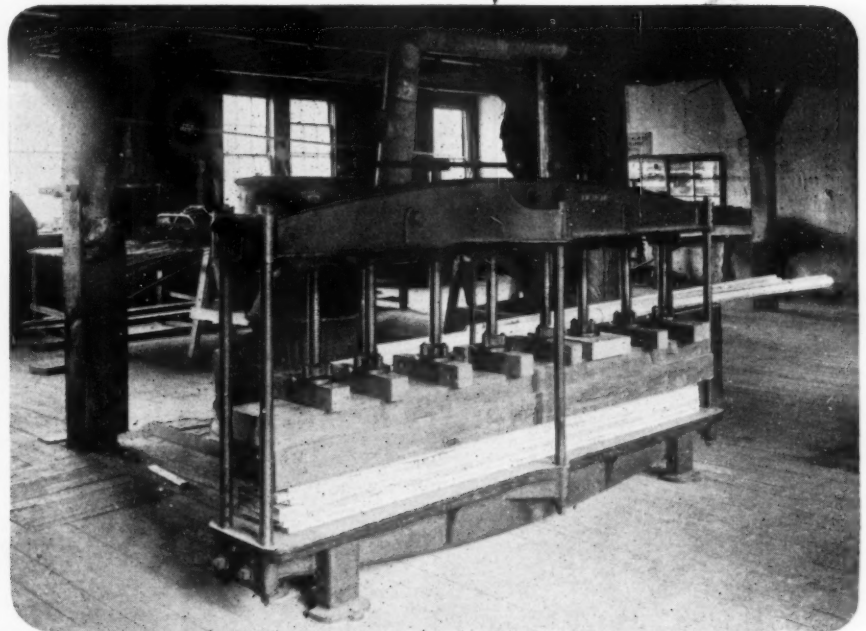
A type of airplane design in which the operator is seated at one end and the passenger at the other end



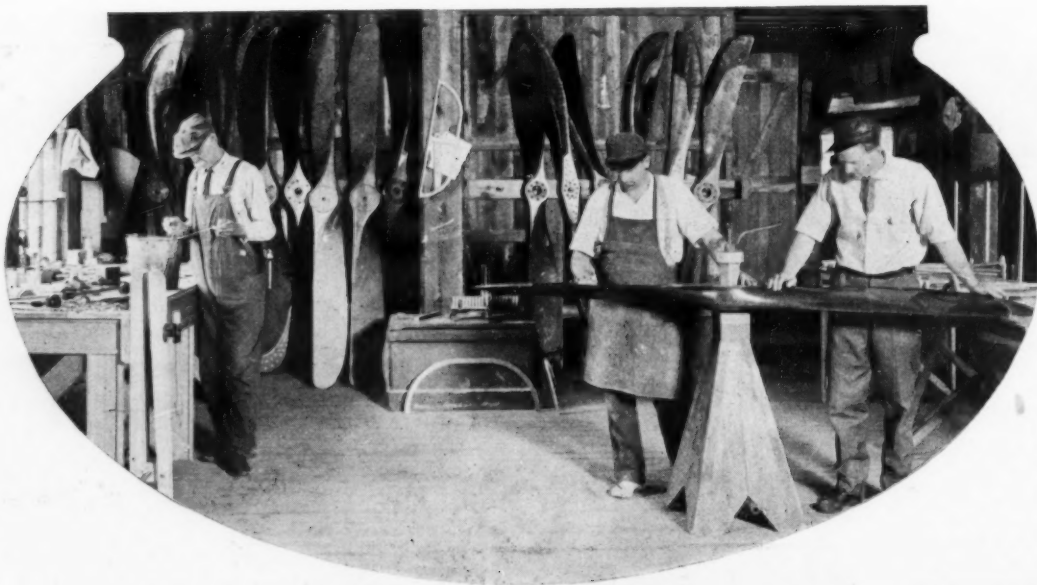
To add strength diagonal wiring is used largely in airplane frame work. Each wire has a turn-buckle to bring it to proper tension. Light stampings generally are used in the frame work of the airplane, where the wood pieces are united. The stampings appear above in black



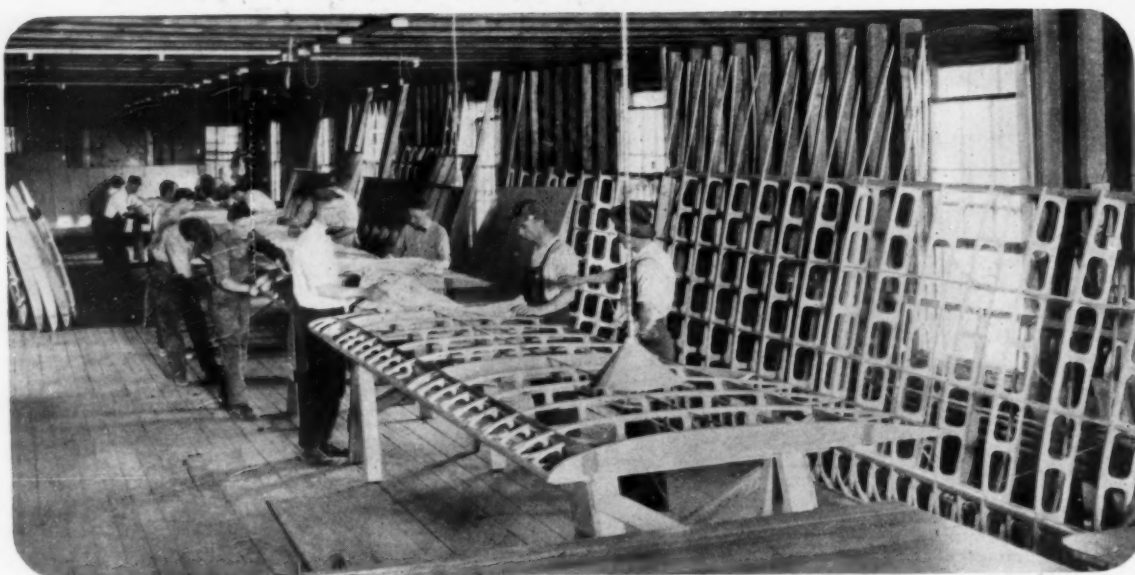
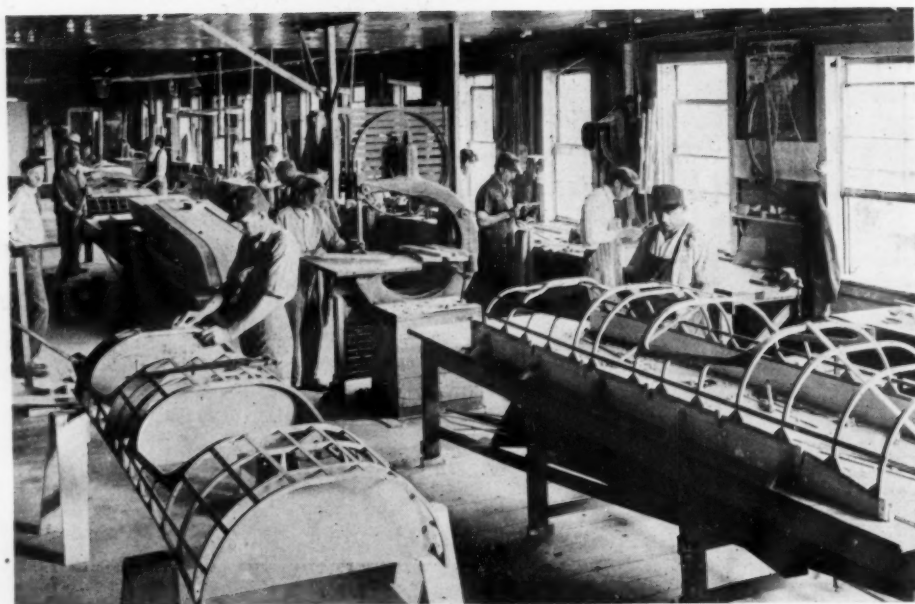
Airplane wheels are generally of the wire type similar to motor car wire wheels but smaller diameter and stronger. They are covered on each side with canvas and this is shellacked as shown in the illustration. This work is intended to cut down air resistance for a plane



Propellers are the delicate parts of airplanes. They are affected greatly by temperature and when not in use propellers on the airplane generally are encased in huge stockings which fit as snug as a glove. This illustration shows seven thicknesses of wood being pressed together. From this the propeller is made after the pressure is applied



A room in the propeller division of an airplane factory, above. General view of airplane factory where the body workmanship is carried on. The light curved wood pieces are made from the very finest wood. There is a great deal of waste in selecting only the best pieces, which accounts for the high cost of the airplane



General view in room where airplane wings are manufactured. The wing must be very light, yet afford maximum strength. The wood has to be very carefully selected to have a straight grain for necessary strength. This maze of delicate woodworking for the plane is entirely hidden when covered with cloth

Truck for Short Haul!

States Pledge Efforts to Establish
Return Loads Bureaus and
Express Routes

A Road-Making Policy Will Be
Asked

WASHINGTON, June 8—Representatives of twenty-three State Highways Transport Committees met with the Highways Transport Committee here this week and planned an intensive campaign for the establishment of return loads bureaus and rural motor express routes throughout the country.

The immediate necessity of organizing and using at highest efficiency the motor trucks of the country in relieving the railroads of short haul freight and of keeping the farmer at actual food production work on his farm through furnishing him truck transportation to and from town is recognized. These facts were driven home with talks by Government officials and a general discussion. Beginning at once, the Washington committee will issue a weekly bulletin to all state committees, giving each the benefit of all information and data available as to costs, methods of organization and operation, personnel necessary, etc.

The most significant incident of the session came with the address by R. C. Wright, assistant traffic director of the Railroad Administration, who told the delegates that the Railroad Administration looks upon the development of highway transportation by motor truck with the utmost favor and hopes to see it extended to the greatest possible extent in handling short-haul freight and relieving terminal congestion. He looks for no future building of short-line railroad extensions and believes the motor trucks will handle all this business after the war.

Would Mean 100,000 Farmers

C. T. Clayton of the Department of Labor said that if rural motor express routes were in operation in many places as it is now possible for them to operate the result would be equal to putting more than 100,000 of the very best type of farmers into actual production on the best farms in the country.

Both the Food Administration and the Department of Labor have given definite orders to do everything in its power, down to the last man, to help establish rural motor express routes.

The work of the National Automobile Chamber of Commerce in promoting the extension of rural motor express was reviewed by S. A. Miles. District representatives have been appointed in twenty-eight leading cities to carry on this work. The chamber is furnishing pamphlets on all phases of rural motor express extension, and a publicity campaign will be carried on in the 20,000 country newspapers of the United States to educate the farmers to the advantages of this kind of transportation for his produce and supplies.

A resolution was passed urging the Coun-

cil of National Defense to promulgate at an early date a policy that will make it possible for the various states to proceed with road making and repairing on the principal routes necessary for motor truck transportation.

Lieut.-Col. W. D. Uhler of the Army transport service and Captain Vanderelder of the same branch of the French army emphasized the importance of building up truck transportation to meet military needs and told of some of the accomplishments in their respective organizations.

That the two-day conference will give a tremendous impetus to both the return loads and rural motor express movements all over the United States is the opinion of those who are closest in touch with this work, and a very rapid expansion of motor truck service is looked for in the near future.

Highways Committee

WASHINGTON, June 12.—Special telegram—The Government highways committee met to-day and changed its name to the United States Highways Council. The following were appointed representatives of the various divisions of the council: R. L. Humphrey, for the War Industries Board; B. G. Sheffield, for the Fuel Administration; G. B. Clifton, for the Railroad Administration; Logan W. Page, for the Department of Agriculture; Lieut.-Col. W. D. Uhler, for the Army, and J. E. Penypacker, as chairman.

More False Rumors

WASHINGTON, June 12.—Special telegram—Reports that a high tax on gasoline used for passenger cars and motor trucks will be placed in effect in July or August are untrue. These reports published by papers throughout the country are the result of a speech made in Congress advocating such a tax. No bill has been prepared for it.

Reports that the motor car industry has not been curtailed but will be reduced to 25 per cent of the fuel allowance of last year are untrue. The fuel administration is seriously studying the conservation of fuel, but is attempting to save all industries from curtailment insofar as that is possible.

Coal Black List

WASHINGTON, June 10.—Special telegram—A list of industries to be definitely curtailed, compiled by the War Industries Board, the Food Administration, the Fuel Administration, Railroad Administration and Labor Administration is said to be in process of completion.

Industries not doing 40 per cent of Government war work by Oct. 1, 1918, will be reduced 40 per cent in their normal coal allowance. Certain industries doing 100 per cent war work and administrative consumers will receive 100 per cent coal, with those companies doing 40 per cent war work given next the preference. Those doing less or no war work will have little chance for a constant fuel supply, according to a warning issued by the Fuel Administration.

Both the serious obstacles to normal production and the menace of steel shortage

Duray to Race June 22

Old-Time Driver on Leave from
France Signs Chicago
Entry Blank

Ralph De Palma Will Start from
Scratch

CHICAGO, June 10—Arthur Duray of the French army, old-time racing driver, who finished second in the 1914 Indianapolis contest, is here and will enter the derby scheduled for the Chicago speedway June 22. Duray is in this country in connection with work for the aviation service of the French government. He brought no car with him from Europe but will handle a Frontenac car which has just been purchased by Harry Harkness. Manager Charles S. Porter has offered him a bonus of \$5,000.

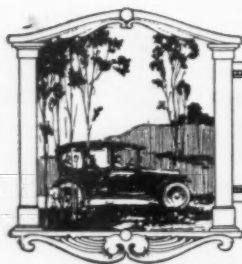
Aside from the Indianapolis race in 1914 Duray participated in the old-time Vanderbilt cup races on Long Island in 1905 and 1906. More recently he has taken part in the battles of Verdun and other great engagements of the last three and a half years. He is a New York-born Belgian and volunteered in the French foreign legion when war broke out. Only a few weeks ago he was released from active service to handle matters of importance to the air service. In 1918 Duray drove the 300-hp. Fiat racer and attained a speed of 143 m.p.h. for the flying kilometer.

Ralph de Palma, winner of the 100-mile Harkness Trophy race, will start from scratch in the derby, which will be run as a 100-mile handicap. De Palma asked a bonus of \$5,000 if compelled to start from scratch but was offered the bonus if he started from scratch and won the race and has consented to that plan.

Six other entries have been made: Tom Milton, Eddie Hearne, Dario Resta, Louis Chevrolet, Ralph Mulford and Ira Vail.

created by the steel agreement bring non-war industries into difficulties. The passenger car industry is, according to all reports, considered a non-war industry in Washington. The black list will inform non-war industries of their position as regards raw supplies. Washington officials believe that it will be better to definitely inform these industries what they can expect in the matter of receiving raw materials than to hold them off longer with vague promises and evasions. They point to the three important factors, labor, coal and transportation, claiming a serious shortage in all. The report is to the effect that many manufacturers will be compelled to stop entirely, while others will be curtailed to great degree. It is anticipated that the priorities board of the War Industries Board will be the departmental organization which will be the agency for working out the black list.

It is claimed that the United States will fall short 60,000,000 tons of its normal coal needs for this coming winter, and there will be little opportunity for manufacturers of non-war requirements to secure their quotas.



EDITORIAL PERSPECTIVES



Recognition of Road Needs

FURTHER road encouragement has come out of our Capital. A representative of the Railroad Administration, speaking before a Highways Transport Committee meeting, in itself a momentous event, foresees no future building of short-line railroad extensions and believes the motor truck will handle all this business after the war. The conference as a whole emphasized the necessity of organizing and using at highest efficiency the motor trucks of the country to relieve the railroads and keep the farmer at his highest efficiency. The development of highway transportation by motor truck is considered with highest favor. Importance of highway construction and maintenance as a fundamental of efficient motor truck transportation was considered, and a resolution will urge the Council of National Defense to promulgate at an early date a policy that will make it possible for the various states to proceed with road making and repairing on the principal routes necessary to motor truck transportation. Other encouragement out of the Capital is that in regard to transporting road materials, reported in the issue of last week, the effect of which is apparent.

THE action of the Railroad War Board in reversing the program in regard to the transportation of stone, sand, gravel and other road materials in open-top freight cars points to Governmental recognition of the necessity of an efficient highway system in these wartimes. The present ruling permits coal, coke and ore cars to carry road-building materials on return loads, a service which will not interfere greatly in the transportation of coal, coke or ore but which will do much toward satisfying a part at least of the demand for road materials. Governmental recognition thus goes far toward meeting the views expressed by various large bodies meeting in conference during the last few

months; even though it must go further still before it can make it possible to have a system of highways that will carry the traffic of the 400,000 motor trucks which to-day are in the service of the country.

THIS country has approximately 2,500,000 miles of highways. But what kind are they? Highway authorities state that the very large majority of this mileage is such that will be scrapped by time in favor of hard-surfaced, permanent, year-round roads that will bear up under the traffic of heavy trucks traveling at more than 20 m.p.h. It was with this in mind that the United States Chamber of Commerce adopted its road policy at the annual meeting in April. It is in line with this that the Railroad War Board's ruling in regard to the transportation of sand, gravel and other road materials is issued. The necessity of the recognition of highway needs is becoming more apparent all the time. Even the highway organizations of the state of Illinois meeting to consider the campaign for the issue of \$60,000,000 worth of road bonds—after the war—could not help but think of Canada's attitude toward road-building in these wartimes as a military necessity as a contrast to our own national policy. The country is willing to hold up all road work if necessary, but it is not necessary, and the step taken in the recent decision from Washington is encouraging in that it shows the Government recognizes this condition.

IN this decision road materials are classed as secondary to coal, coke and ore rather than with talking machines, material for moving pictures and furniture, with which they were classed last fall. That in itself is encouraging.

Why Wheat Tractors Pay

AN unprecedented demand for tractors for the wheat harvest is reported from the Missouri River bottoms. The reason is easily apparent in view of the facts affecting the harvest this year. Wheat in this section will make up to 35 bu. to the acre. One binder propelled by a 9-18 or 10-20 tractor can make three rounds of a wheat field while a binder drawn by four and five and even six horses makes two rounds of the same field. In addition, the tractor can put in longer hours than the horses can. Horses and mules in this section are delayed at least twice a day by the intense heat and humidity of working in the bottoms in harvest time.

THIS tremendous harvest has given rise to tremendous tractor sales—for this region. Scarcity of farm labor to handle horses is another reason. The same tractors will be used in late July and August to break ground for the 1919 wheat crop. The state of Missouri alone has 2,250,000 acres of wheat this year, compared with 1,125,000 acres in wheat last year. Much of the increased acreage must be handled with tractors. There is less farm labor and fewer horses able to stand up under the heavy work and long hours of the wheat harvest. The tractor has proved its worth in other than wheat, but if further proof were needed these wheat tractors could give it.

We Should Keep All Our Power

THOUGH the Government needs money to carry on the war it does not expect to take money away from the Navy to clothe the Army. It does not expect to weaken one fighting power to reinforce another if both are needed. The Government also takes care not to tax out of existence an industry or institution which is actually a war necessity when it comes to raising funds by taxation. Yet there is a grave possibility that the Government may tax out of existence many periodical publications, regardless of their character.

THE press is one of the strongest fighting powers of the Government. The country that works without a loyal, forceful, intelligent press back of it works unarmed against the insidious propaganda of the foe. It must have a press that can cooperate with it and fight the unseen forces at work in the country behind the back of the Government. Taxation that drives part of that loyal press out of existence is deplorable. There should be some quick remedy for a quick injury. One very necessary power is being weakened to strengthen another.



An American ammunition train June 2 helped save the day for Americans, blocking the road from Chateau-Thierry to Paris. Shortly after daylight the call for ammunition came. The nearest point from which it then could be obtained was 45 miles away. Thirty-two huge motor trucks, preceded by officers in a touring car, did the job. The trip was completed and the ammunition loaded and unloaded within 13 hr.

THE trouble is legislators cannot realize the injury that will be wrought by this form of taxation. Did you, reader, know that the postal zone law which is to go into effect July 1, strikes even the catalogs and "Courses of Study" issued by our colleges and universities as second class matter. Like the business, class, trade and technical magazines, these educational publications cannot be discontinued without serious loss to the public. Those issued by the colleges and universities will not be discontinued. But think what the increase of cost

will mean to the too slender resources of our educational institutions already emaciated by the increased costs of war time.

EVERY loyal man and woman in this country is glad to pay increased taxes on income, profits and private correspondence. But there is the loyal press of the country. There is the cost of maintenance in our colleges and universities. Write to your Congressmen at once to demand the repeal of this injurious law. Help keep all our power in the service.

U. S. Aircraft Corporation Is Proposed

Committee Finds Airplane Engine All Right and Delays About Overcome

WASHINGTON, June 11—Special telegram—Organization by the director of aircraft production of a Government corporation to direct production of aircraft and equipment is proposed in a bill introduced by Chairman Chamberlain of the Senate Military Affairs Committee. The Government would control the majority stock, the maximum issue to be \$100,000,000. The corporation would be dissolved a year after peace is signed.

William C. Potter, who has been chief of the equipment division, has been made assistant director of aircraft production under J. D. Ryan, director of aircraft production.

After visiting the plants of the Cadillac, Fisher Body and Lincoln Motors, the Senate sub-committee sent from Washington to investigate the airplane situation reports that the Liberty engine is all right and now that obstacles and delays are about to be entirely overcome, there is no reason to fear the output of airplanes will be below expectations. The committee is composed of the following United States Senators: Charles S. Thomas of Colorado, chairman; Joseph S. Frelinghuysen of New Jersey; Harry S. New of Indiana; and James A. Reed of Missouri. Senator Hoke Smith of Georgia, the fifth member of the committee, was detained in Washington and is not on the tour of investigation.

By Sept. 1, 1919, 19,000 Liberty engines will have been delivered to the Government, according to the committee. Dayton-Wright is the only company that has shipped combat planes. Its first was shipped in February.

Senator Frelinghuysen stated that much of the delay the air program has suffered is undoubtedly due to the vacillation that attended preparation of plans and specifications for engine parts.

An appropriation of \$16,000,000 for the establishment of sixteen airplane and balloon stations on the Atlantic and Pacific coasts for protection against aerial and submarine attacks has been asked by Secretary of War Baker. The sites for the stations have been selected, thirteen on the Atlantic and three on the Pacific. The equipment is immediately available, and they can be established within six weeks. The \$16,000,000 will be included in the \$7,000,000,000 fortifications bill to be presented to the House of Representatives next week.

FILLING STATION FOR AIRPLANES

Bloomington, Ill., June 8—What is believed to be the first filling station for airplanes in Illinois has been installed by the Bloomington Association of Commerce. A 40-acre field has been leased at the east edge of the city as a landing place, this field being marked by a circle of crushed stone 16 ft. in diameter. A gasoline tank is located conveniently and can be opened only by keys carried by the aviators.

Every few days, a corps of the birdmen fly to Bloomington from Chanute field at Rantoul, 40 miles east, on practice flights. A lofty flag pole has been erected, upon which a flag will fly at all times to indicate the direction of the wind.

The landing field just laid out here is without a single tree and no other object to interfere with the landing, while in addition there is not a telephone or telegraph pole within a half mile. The circle of stone in the center is clearly visible at a height of 1000 ft. or more.

ST. LOUIS AERIAL MAIL JUNE 22

Chicago, June 10—A permanent aerial mail route is to be established between Chicago and St. Louis, Mo., June 22. Postmaster W. B. Carlisle has received word from Washington to swear in Miss Katherine Stinson as a mail clerk for a flight to St. Louis, leaving here that day. This will be the second mail flight of Miss Stinson. The first was to New York.

ARMY REPAIR SHOPS IN TEXAS

San Antonio, Tex., June 8—The War Department plans new motor repair shops here, to cost approximately \$1,000,000. One of the objects of their erection is the training of large forces of motor mechanics and the belief that greater results can be accomplished in this way than by having small shops scattered at various places.

These shops, together with the reclamation shops about to be occupied here, and

the dry cleaning establishment that has been decided upon, will make San Antonio one of the largest army repair cities in the country and will add greatly to its importance as a permanent military center.

The present motor repair shops, designated as Mechanical Repair Shop No. 304, under command of Major Mark Ireland, are in temporary buildings between Fort Sam Houston and Camp Travis.

The motor repair shops will be one of three in the United States. The others will be at Atlanta, Ga., and Baltimore, Md.

The shops are to be erected on an 84-acre tract near Kelly Field. It is understood that the equipment of the shops will cost \$500,000 and that in peace times the shops will have a force of 2500 men. In war times the force required will be larger.

AERIAL MAIL TO BOSTON SOON

Washington, June 7—Extension of the aerial service to Boston is planned within the next few weeks. Six airplanes have been ordered for this route, and schedule will be arranged to meet the Washington-New York flights.

The Postoffice Department, through its air mail service to New York, is making meteorological observations. One plane in a "ballast" attained an altitude of 15,300 ft. over Laurel, Md., which showed wind pressure was materially lessened, as compared with lower altitudes. The engine power showed a reduction but not relatively as great as the wind decrease. The temperature at that elevation was 30 per cent less than ground level.

TRACTOR TRAIN ON SCHEDULE

Detroit, June 7—A tractor train consisting of a Walter tractor and two 5-ton trailers is operating on a regular schedule between Detroit and Toledo, two trains leaving

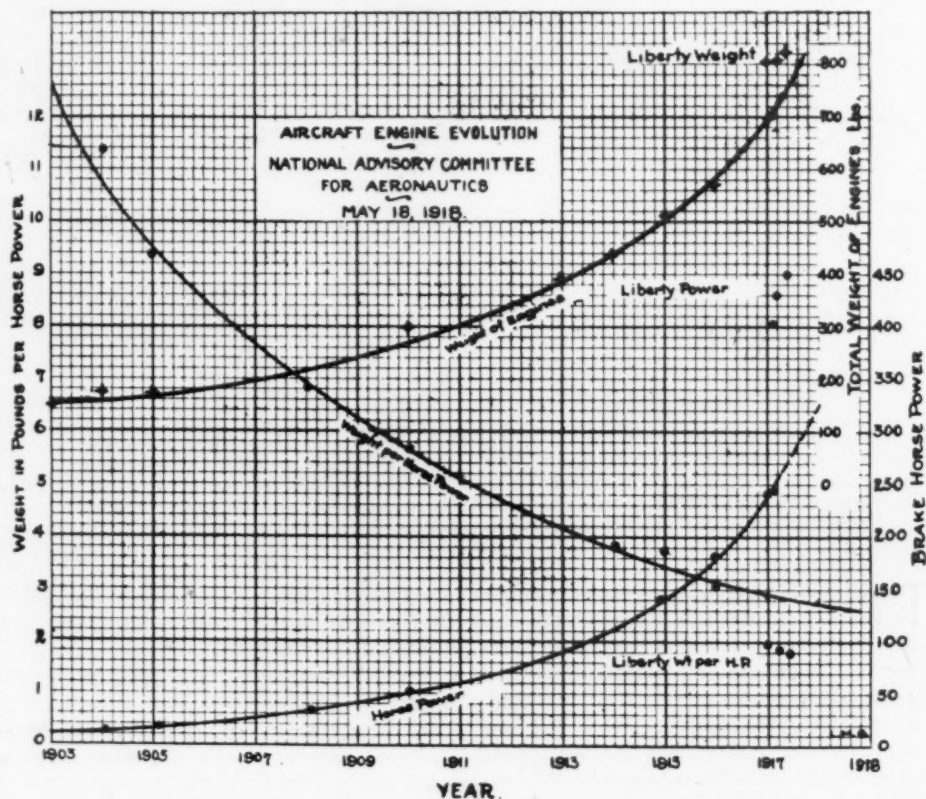


Chart showing evolution of the Liberty aircraft engine design

ing each city daily. On account of a detour that has to be made near Monroe due to the construction of the road the trips now consume 9 hr. After the road is completed it is expected the running time will be cut down considerably. It is claimed by the company that these tractor trains are less harmful to road surfaces than ordinary 5-ton trucks loaded because of the even distribution of weight.

Owing to the critical steel situation the trains have had little to carry on the trips to Detroit but capacity loads have always left from this city to Toledo. Nearly everything carried pertains to the automotive industry—motors, springs, bearings, steel, valves, rims, bushings, machinery and submarine chaser plate liners. By fall the company expects to extend its operations to Cleveland, Canton, Akron and Alliance.

The organization, incorporated for \$100,000, is composed of purely Toledo capital. Jesse D. Hurlbut is president. He is also treasurer of the Toledo Grain & Milling Co.; Frank C. Schmidt, president and treasurer of the Frank C. Schmidt Realty Co., is vice-president and general manager; Frank L. Baird, of the law firm of Brown, Hahn & Sanger, is secretary.

WAR PROFITS OVER \$7,000,000

Toledo, June 7—Willys-Overland profits on war business should run between \$7,000,000 and \$8,000,000, or within 20 per cent of the 1917 manufacturing profits. There is little doubt but that in the second quarter alone, it will earn its entire preferred and common dividends for the year. J. N. Willys stated at the annual meeting that for all this new business separate departments and organizations have been created, so that there would be no factory or financing readjustments this year.

The company produced and shipped 1004 airplane engines last month and will ship as many during this month. A contract for 3000 gun carriages has been received by the company, deliveries on which will begin this quarter. It also has a contract totaling \$10,000,000 for machining 8-in. shells, which it is peculiarly well able to handle.

Liberty Engine Makes 450 hp. at 825 lb.

Fifty Per Cent More Powerful and 25 Lighter Than Average Aviation Model

WASHINGTON, June 8—The Liberty airplane engine develops a maximum of 450 hp. at a weight of 825 lb., or 1.83 lb. per horsepower, and is 50 per cent more powerful and 25 per cent lighter per horsepower than the average airplane engine in service to-day. This is according to a statement by the National Advisory Committee on Aeronautics. In March the Liberty engine developed 432 hp. at a weight of 808, or 1.86 lb. per hp. In May, following improvements, the Liberty engine developed 450 hp. at a weight of 825 lb., or 1.83 per horsepower. In 1917 the Liberty twelve was 85 per cent more powerful and 28 per cent lighter per horsepower than the average in service for that year.

Compared to Wolsley

In its statement the committee shows that Wolsley engine in 1913 could obtain only 147 hp. at 1400 r.p.m. from eight-cylinders 5 in. bore by 7 in. stroke, or 18.375 hp. per cylinder. This is the same size cylinder as used in the Liberty engine which now gives 450 hp. at 1800 r.p.m. from twelve cylinders, or 37.5 hp. per cylinder, which is double the power per cylinder obtained in the Wolsley. The Wolsley weighs 4.9 lb. per horsepower with 2.3 lb. for the Liberty at the same speed of 1400 r.p.m.

The statement explains that the first man-carrying airplane flights were made in 1903 with the Wright Brothers' engine, developing 12 hp. and weighing 152 lb., or 12.7 lb. per hp. In 1910, seven years later, the average horsepower of airplane engines had increased to 54 hp. and the weight decreased to 5.7 lb. per horsepower. In the other seven years the average power output had advanced to 243 hp. and the weight decreased to 2.8 lb. per horsepower. Again in 1918 the horsepower advanced

with the perfection of the Liberty engine to 450 horsepower for a weight of 825 lb., or 1.83 lb. per horsepower.

The average fuel consumption decreased from .8 lb. per horsepower in 1903 to .65 lb. in 1914, since which it has slowly dropped to .55 lb. in 1918 and for the Liberty to .15 lb. The present Liberty consumption is approximately .46 lb. per horsepower per hour.

Following is a total which shows the advancement in the average power and weight ratio by years for the engines in actual flying use.

	Year	Horse Power	Weight per H.P.
Langley-Manly	1901	52	151 2.9
Original Wright Brothers	1903	12	152 12.7
Improved Wright Brothers	1904	16	180 11.4
Improved Wright Brothers	1905	19	180 9.5
Redesigned Wright Brothers	1908	35	182 5.5
Average on market	1910	54	309 5.7
Wolsley engine	1913	147	720 4.9
Average on market	1914	112	437 3.9
Average on market	1915	133	512 3.8
Average on market	1916	185	570 3.1
Average on market	1917	243	693 2.8
Liberty twelve-cycle	1917	400	801 2.0
Liberty twelve-cyl. (March)	1918	432	808 1.9
Liberty twelve-cyl. (May)	1918	450	825 1.8

MAY RUBBER IMPORTS LESS

New York, June 12—Special telegram—Rubber imports dropped slightly during May, this being the first month during which the Government curtailment program is effective. A total of 16,288 tons came in, which is 2,123 tons less than during May, 1917, when the total was 18,411 tons. During the first five months of 1917 imports totaled 72,985 tons as against 75,344 tons during the same period this year. Although the Government order restricts imports between May 6 and July 31 to 25,000 tons, most of the rubber which came in during May was free rubber and not subject to the curtailment order, as a big percentage of it was shipped prior to May 8. It is understood that the tire manufacturers have fairly adequate stocks on hand to carry them through the curtailment period.

NEW WAR BUSINESS FOR CURTISS

Toledo, Ohio, June 7—It is reported that nearly \$25,000,000 worth of new Government business has been obtained by Willys-Overland and the Curtiss Aeroplane & Motor Co., the nature of which has not yet been disclosed.

According to a statement made by John Willys, an approximate average of twenty planes and four flying boats are being produced daily by the Curtiss and Overland companies. To date the plants have built between \$5,000,000 and \$6,000,000 worth of airplanes and flying boats for the United States and the Allies.



Our own U. S. army airplanes trying out in formation

N.A.C.C. Has Conservation Committee

Will Investigate the Possibilities of Eliminating Unnecessaries to Win War

NEW YORK, June 7—The National Automobile Chamber of Commerce at its annual meeting yesterday and to-day decided to appoint a committee to delve deeply into standardization and conservation matters with a view to co-operating more closely with the Government in saving materials. Charles Clifton, president of the Pierce-Arrow Motor Car Co., Buffalo, was re-elected president, and all other officers were re-elected, the only change being in the board of directors, where H. H. Rice, Chevrolet Motor Co., takes the place of the late Colonel Pope.

In the matter of conservation, it is the plan of the chamber to investigate the possibility of eliminating unnecessaries such as the use of virgin wool for upholstery material, vanity curtains in limousines and other things of the like. An effort will be made to substitute more common materials for those that are in great demand for war work, such, for example, as chromium steel and tin.

Thirteen New Members

During the year gone by, thirteen manufacturers of trucks have been admitted to membership, bringing the list up to fifty-two makers of trucks and eighty-five of passenger cars. The companies added were: Aeme Motor Truck Co., Cadillac, Mich.; Bethlehem Motor Corp., Allentown, Pa.; Brockway Motor Truck Co., Cortland, N. Y.; Clyde Cars Co., Clyde, Ohio; Diamond T Motor Car Co., Chicago; Dorris Motor Car Co., St. Louis, Mo.; Republic Motor Truck Co., Alma, Mich.; Sanford Motor Truck Co., Syracuse, N. Y.; Schacht Motor Truck Co., G. A., Cincinnati, Ohio; Service Motor Truck Co., Wabash, Ind.; Standard Motor Truck Co., Detroit; Stewart Motor Corp., Buffalo, N. Y.; United Motors Co., Grand Rapids, Mich.; Ward Motor Vehicle Co., Mount Vernon, N. Y.

It has been recommended that the motor truck division appoint a committee to investigate the possibility of further standardization, particularly with reference to axle widths and treads. Roy D. Chapin, chairman of the Highways Transport Committee, addressed the meeting on return loads bureaus, and Sam A. Miles spoke on the development of rural express routes, in which the chamber is taking an active interest and to which it is lending every support. The production of trucks, it was pointed out, has increased 100 per cent during the last six months, as compared with the same period of last year.

The traffic committee estimates that the 25 per cent increase in freight rates, which is to go into effect June 25, will mean an increase of \$6,000,000 in the cost of transportation, based on shipments equal to those of last year. A standard 36-ft. carload shipment will cost \$19.25 more between Detroit and New York, and \$77.50 more between Detroit and San Francisco, than the old rates. Through intensive loading methods, which means more improved double decking and particular crat-

ing, some members have been able to increase the capacity of freight cars from 50 to 100 per cent.

The proposed ruling of the railroads to require that cylinders, cylinder blocks and castings and transmission cases be boxed for shipment has been abandoned following protests from the traffic committee of the chamber. Such parts may now be shipped in racked cars. It is expected that the proposed consolidated classification, which is to be a combination of the present Western, Eastern, or Official, and Southern classifications, will be completed sometime this month, and though this may not affect rates, it will provide for uniform descriptions and weights throughout the country.

The export committee of the chamber is to make a special study of packing and crating for export with a view to adopting such measures as may seem advisable to conserve shipping space. It will also investigate the possible application of the Webb bill to the motor car industry.

With regard to the truck and tractor show which is to be held in Chicago this fall it was decided to notify members of the Chicago Automobile Dealers' Association that their participation be left to their own discretion; it was the sentiment of the truck makers themselves that they would not exhibit because it is deemed that the time is not opportune.

The next meeting of the chamber will be held at the New York offices July 10.

M. A. D. ENDORSES WAR MOVE

Milwaukee, Wis., June 10—The decision of the War Economy Board of the National Automobile Dealers' Association to close garages, service stations, tire and accessory stores and shops at 6 p. m. daily and

on Sundays and holidays, to release 30,000 mechanics to the Government service, was adopted and ratified by 212 individuals, firms and corporations of Wisconsin at a meeting called by the Milwaukee Automobile Dealers, Inc., at Milwaukee last week. The remaining members of the industries are signing ratification cards, and it is expected that Wisconsin will stand 100 per cent within a short time.

As a result of the decision, the M. A. D. is preparing a pamphlet explanatory of the wartime policy for distribution among owners. It will give the names and locations of the five emergency stations.

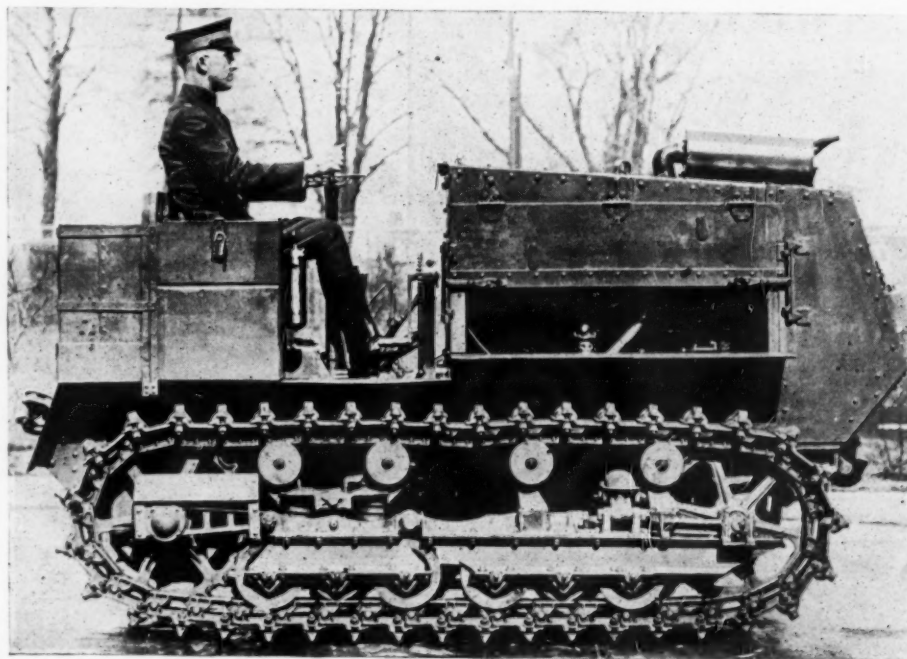
The M. A. D. also contemplates the establishment of a trade school in automotive mechanics to replenish the supply of skilled workers by training men below and above the present draft ages. The plan is similar to that adopted in Canada after one year of war.

The directors of the M. A. D. are considering the organization of divisions of associate memberships for truck, accessory and tire owners, which will add about 100 to the member roll.

It is stated that the new regulations promulgated by the national dealers' association at the request of the Government will not throw any men out of employment in Milwaukee, save perhaps a small few. More than 500 mechanics already have been taken from the pay rolls of local establishments by voluntary enlistments and the selective draft, and for some time past there has been a virtual shortage of men.

CHICAGO PLANS FOR DEALERS

Chicago, June 8—Chicago motor car dealers at a meeting yesterday unanimously adopted the recommendations of the War Economy Board at Washington regarding service during the continuance of the war. The action of the Chicago dealers was in line with the resolution adopted at the meeting of the board of directors of the N. A. D. A. at St. Louis May 17-18, when dealers everywhere were called upon to enforce the recommendations



The 5-ton artillery tractor that has been accepted by the army

of the War Economy Board. Yesterday's meeting was addressed by E. E. Peake of Kansas City, executive secretary of the N. A. D. A., and president of the National Association of Automobile Show Managers.

The Chicago Automobile Trade Association will entertain the delegates attending the national convention of the N. A. D. A., which will be held at the La Salle Hotel here, June 14-15. A dinner will be held Friday evening at the South Shore Country Club and Saturday afternoon the delegates will be guests of the association at a baseball game between Chicago and Washington.

WHITE CONCENTRATES ON TRUCK

Cleveland, Ohio, June 7—The White Motor Co. produced 5900 trucks and 1000 passenger cars in 1917. It is reported that its output of passenger cars this year may not reach in excess of 100. Its truck business will be 60 per cent above last year, it is stated. It is now working on an order for 3000 1- and 2-ton trucks for the Army. The company is finishing an order for France for 1500 trucks and has delivered 8000 trucks to Russia and 6000 to France since the war began. The capacity of the plant is thirty-two trucks a day, which will be increased to fifty. It is reported that the year's business will amount to between \$40,000,000 and \$45,000,000. Over 70 per cent of the company's capacity is given over to war work.

WOLVERINE PLANS NEW MODEL

Saginaw, Mich., June 7—The Wolverine Tractor Co. expects to manufacture a four-wheel-drive machine with a creeping attachment. Production is expected to begin not earlier than September.

REGAL SALE FIXED FOR JUNE 26

Detroit, June 7—All property and assets of the Regal Motor Car Co. will be sold June 26 at public sale. The service department will be offered as a going business.

Army Adopts Class B Truck Officially

U. S. Will Use 3-Tonner in All Departments Requiring This Capacity

WASHINGTON, June 7—The 3-ton class B truck has been adopted officially as the standardized heavy-duty cargo truck for use by the Army in all its departments requiring this capacity truck. This announcement, made by Secretary Baker today, marks the first step toward settlement of the controversy created by the opposition to the standardized trucks by certain interests. A series of tests for power and fuel consumption were held here secretly three weeks ago, as announced in MOTOR AGE, to determine which trucks were best. Many standard makes of trucks competed with the standardized trucks. The announcement by the War Department emphasizes the quality of superiority of the class B truck in comparison through actual tests with the standard makes of trucks.

The class B war truck is a truck designed by automotive engineers who assembled in Washington last summer for this purpose. It is the truck of which 10,000 were ordered under the direction of Christian Girl as head of the Motor Transport Section of the Quartermaster Department. Of these trucks 8000 more were ordered last week, making a total of 18,000 on order, of which more than 3000 have been delivered with production now well over 100 per day. When the opposition to the standardized trucks became most severe and it appeared as if the interests opposed were certain to be victorious, and when General Chauncey B. Baker, who headed the standardized truck movement for the Army, was removed from office and transferred to Chicago, other interests in Washington in favor of the standardized truck went directly to Secretary of War Newton B. Baker, who as a result, ordered the tests. It is expected that other announcements

will be made soon, as to the worthiness of the A and AA types of standardized trucks and standardized motorcycles, which were also tested.

The tests have not been made public. It is doubtful if they will be. To make public announcement of them would be to give publicity to the inferiorities and superiorities of various private makes of trucks and motorcycles. Reports are coming from authoritative sources, indicating that all three of the standardized trucks, with the standardized motorcycle, made excellent showings in every test, except in one instance, where the new standardized four-wheel-drive truck displayed superiority in climbing over a log, one test in which the four-wheel-drive would naturally be expected to be superior.

JANESVILLE TO BUILD SAMSON

Chicago, June 13—A coalition has been formed between the General Motors Corp. and the Janesville Machine Co., Janesville, Wis., whereby Samson Sieve Grip tractors will be built in large numbers in a new factory to be built at Janesville, Wis., by the G. M. C., and sold to the trade with Janesville power farm equipment. J. A. Craig, general manager of the Janesville Machine Co., will have control of both factories and will have general supervision of the marketing of both tractors and equipment.

ST. LOUIS FORD PLANT TAKEN

St. Louis, June 7—W. C. Anderson, manager of the Ford assembly plant here, has received notice that the building will be taken over within thirty days by the Government as a food warehouse and that Ford work here will cease. Mr. Anderson says that the working force in the plant has been reduced from 700 to 300 men, and these have been offered positions in the food depot if they care to take them.

NEW SERIES FOR UNITED MOTORS

Grand Rapids, Mich., June 7—The United Motors Co. will in five weeks start production on a new series of models including 1½, 2½, 3½ and 5-ton capacities. The models will be ready for shipment in sixty days. It is estimated that an output of fifty trucks a month will be maintained. The prices of the models have not as yet been determined.

MARTIN LICENSES FOUR CONCERNS

Springfield, Mass., June 8—The Martin Rocking Fifth Wheel Co. has granted license under its patent covering "the truck and semi-trailer with rocking connection" to the Watson Wagon Co., King-Trailer Co., Highway Trailer Co. and the United Truck Co. These licenses, with the exception of that to the United Truck Co., do not include the patents covering the quick-attaching and detaching features or the spring shock absorbing features.



U. S. 5-ton tractor shown on opposite page undergoing official tests

"Come and Get It"

A Day with the Broncho Busters of the Army Mechanical Pack Horses—Glossary of Army Truck Parlance

By Allen Sinsheimer

"THEY are all gassed, sir." No, this is not a French expression. Neither does it tell of mortality. It merely means that the truck gasoline tanks have been amply supplied with gasoline.

"Turn her over." Whenever the convoy stops either for a cargo, mess or a rest en route, this is the phrase, meaning: "We are now ready to continue our journey. Kindly step to the crankshaft, grasp it firmly, develop great muscular strength and at the same time and quickly, lift it from lower to upper position, doing this as often as is necessary to marry the gas vapor and the electric spark.

"Come and get it." This is the polite way of saying: "We

are now serving a meal in the dining car (mess truck). Will you kindly step up and satisfy your appetite?"

"Bring up the bottle." A serious command. This means that the gasoline tank of a truck is empty or almost depleted and invites the driver of the tank truck, carrying the gasoline supply, to replenish the cargo truck by bringing his truck into position.

"We'll stop and feed the babies." There are no babies as a part of motor supply train equipments. This term only conveys the information that the trucks are not sufficiently supplied with gasoline and oil, and that a stop will be made for that purpose.

Twenty-four Hours with the 8th Division Supply Train

MAY 31—4 p. m. Arrived at Washington from Camp Holabird, Baltimore, Md., the convoy comprising thirty-three trucks, one roadster, one light repair truck, one touring car. Purpose—to haul office equipment U. S. Shipping Board from Washington to Philadelphia.

5 p. m. At U. S. Shipping Board offices ready for cargo.

5:30 p. m. Commenced loading cargo. F street looked like a garage and a second-hand furniture shop.

6:30-7:30 p. m. Some officer hollered, "Come and get it." The laborers continued loading the cargo. The soldiers disappeared.

7:30-10:50 p. m. Soldiers and laborers loaded cargo.

10:50-11 p. m. Lieutenant Lemlein commanded, "Bring up the bottle." Five-gallon milk cans were filled by the tank truck with gasoline and emptied into the cargo truck tanks.

11-11:10. Lined up on H street ready to leave. A Red Cross division drove up, spoke to an officer and the order came, "Come and get it." Sandwiches and lemonade quickly disappeared.

11:10 p. m. Left for Philadelphia. Captain Jones drew out his six-shooter and loaded it. He turned to the trucks and ordered rifles loaded and conveniently slung. "Taking no chances with enemy activities," he said. "We carry too many valuable papers."

June 1—1:20 a. m. Stayed on straight road instead of turning. Found out mistake after eight trucks had followed over wrong road and a railroad crossing.

1:30 a. m. Backed up the eight trucks, regained right road and continued.

2 a. m. Pilot in touring car fell asleep at the wheel coming down incline with 40-ft. ditch at the left and wooden fence between ditch and road. Nearly swallowed pipe hollering just in time to cause pilot to wake and swerve.

3 a. m. Arrived at Baltimore. Picked up spare parts from a Camp Holabird truck sent to meet us. "Gassed."

3:30 a. m. Left Baltimore losing the road ending up at the back yard of a factory on a heavy mud lot.

3:30-4:45. Backed trucks off lot and took wrong road to Philadelphia.

6:30 a. m. "Come and get it." Second invitations were unnecessary. The sun coming up through a mist like a pale white moon, the fog, the tired men, the wet, muddy trucks—"If it looks like this in this country what do they look like in France?"

7 a. m. Turned over cross road to right Philadelphia highway.

8 a. m. Passed through Bel Air, Md., and went too far, missing correct Philadelphia turn. Swung trucks around city square and reached proper road. Citizens turned out en masse—about thirty—to look at the Army.

8:30-8:40 a. m. Stopped to clean a gasoline line. Drivers threw themselves in the grass. Warned not to fall asleep.

9:10-10:15. "Fed the babies." Everybody rested except "the milkmen." They were busy "bringing up the bottle."

2:10 p. m. Arrived Newark, Md. Telephoned police ahead for pilots. Ice cream sodas. Lots of girls. Soldiers wide awake.

2:45 p. m. Left Newark, escorted by Wilmington, Del., motorcycle policeman. Rough roads. Hot weather. Everybody tired.

3:45 p. m. Arrived Wilmington, Md. Drew up on a residence street. "Come and get it." Residents out in crowds, especially little children. Cigars and food offered soldiers by citizens. "Gassed." Repaired bent shackle delaying until

5:15 p. m. Left Wilmington.

7:10 p. m. Met head Philadelphia police department and motorcycle squad. Given right of way over all traffic from city limits to city hall. Men, very tired, drove at 6 m.p.h. Tire came off one truck. Left it standing, for later repair, under guard.

8 p. m. Reached U. S. Shipping building.

8:11 p. m. Unloaded cargo. Crowds interfered with the work.

8:30-11:30 p. m. Unloaded trucks driving each truck to roped inclosure at city hall for the night when unloaded and going to "Come and get it" as soon as truck was parked.

A Testimonial of Appreciation

UNITED STATES SHIPPING BOARD

Washington.

Mr. Jesse H. Neal,

Executive Secretary,

The Associated Business Papers.

My dear Mr. Neal:

I want to tell you and those connected with the division of advertising that the services rendered to the United States Shipping Board and the Emergency Fleet Corp. by the business papers in our recent campaign for Shipyard Volunteers, deserves our highest commendation.

The editorials which these papers published and the advertisements bearing coupons, and post cards to be filled in by those desiring to enroll in the Shipyard Volunteers materially helped us in securing our full quota of volunteers.

I recognize the great force of the technical and trade press of the country, and particularly in these critical times, both with relation to business as well as to the war.

Please accept this as a testimonial of my appreciation of your very valuable services and the assistance given us by the Associated Business Papers.

Sincerely yours,

EDWARD N. HURLEY,
Chairman.

On the Road with Class B Trucks



Waiting for the tail enders to catch up. Captain Jones, in command, in the foreground



F street, Washington, D. C., was crowded with class B trucks, office files and furniture



The leader truck, Lieut. Lemlein, company commander, standing in the road. Each truck carried two rifles, loaded



"Come and get it" with the men who made up the personnel of the convoy doing it with a right good will



"The bottle" and "the nursemaids to the truck." The insignia are from each end of the driver's seat



"The nursemaids at work." Some call them the milkmen though they put oil in milk cans



This map shows the approximate position of the old fields captured on the eastern front by the Germans and suggests the possible objectives of further drives

Germany's Oil Drive

Conquest of Petroleum Lands as One of Immediate Objectives of German Military Aggression on Eastern Front

CONQUEST of petroleum lands as one of the immediate objectives of German military aggression seems to have been overlooked by most of the war historians, but operations on the eastern front, viewed in the light of a knowledge as to just what German aggression in that direction has gained, point toward oil as the goal for the German drive in the East. The significance of Germany's drive for oil is considered by *Sinclair's Magazine* to be that arising from the necessity of the control of a large petroleum production for success in arms.

Sought Early Control

Through various means, says *Sinclair's*, the kaiser and his advisers sought, long before Europe was at war, to dominate particularly the Rumanian petroleum industry and because their full object could not be attained by commercial manipulations and political corruption the conquest of petroleum lands became one of the immediate objectives of their military aggression.

Modern warfare requires modern weapons. Modern weapons require petroleum in one form or another, both for operation in the field and for production behind the lines. Petroleum is needed in the factories and shops that turn out guns, ammunition, aircraft, trucks, clothing and provisions, in the building of engines and cars and rails. It is needed in the construction of Zeppelins, submarines and destroyers. It is essential to the speedy movement of armed forces of practically all descriptions on land and sea, in the air and under the waves, and for keeping them supplied with

Illustrations by courtesy of Sinclair's

instruments of defense, with clothing, with food.

In the beginning the Russians held possession of the Galician oil fields. The only important fields under the control of Germany were Alsace-Lorraine and Hanover, and the production of these at the peak was not more than 1,000,000 bbl. a year, too little if the war lasted many months. Rumania was not in the conflict then. It had prohibited the export of gasoline except in emergency, when it had to be exported to get from Germany such badly needed articles as soap, sugar, steel and drugs.

When the Galician fields were taken the security of the Teutonic armies was enhanced, even though the Russian armies did considerable damage to wells and burned much of the stocks above ground.

Then Rumania was overrun and the oil fields there seized. Wholesale damage had been done, mostly at the insistence of the Allied countries. For several months the belief was that oil production in Rumania had stopped entirely and sufficient wrecking had been done to prevent the Germans from obtaining any benefit from the oil fields. More recent information, however, is to the effect that the fields were not destroyed. The Rumanian leaders believed they soon would recapture the territory about to be lost to Germany. About the only means of permanently stopping oil production in Rumania would have been to explode charges of dynamite, nitroglycerine or similar agents within the wells with

sufficient force to flood the oil-bearing strata with salt water. Instead the Rumanian commission which was given authority over the industry proposed to lower into the casing plugs with a secret thread, or taper, so that they could not be removed except by those in the secret. This was declared impractical. The commission also ordered pits to be dug in isolated positions and the oil drained into them and there burned so the tanks and refineries could be left in fair condition.

Wells Were Injured

Almost on the eve of the German invasion aggressive action in regard to the fields was taken. At that time, though, there was neither an adequate supply of explosives nor sufficient men competent to carry out the work. Nevertheless, when the Teutons took possession it was no small task to restore even part of the production. Some conception of the difficulties which presented themselves, says *Sinclair's*, may be obtained from an Imperial and Royal Government memorandum issued April, 1917, regarding German activity in Galician fields, where the conditions were immeasurably better than in Rumania. This memorandum was in part:

In order to relieve the scarcity of lubricating oil, it was arranged that a plant for the manufacture of lubricating oils should be constructed at the state refinery of Drohobycz, in the first place, to cover the requirements of the state railroads and of the army.

Owing to the high prices for crude oil, most of the owners of oil wells have introduced heating by natural gas instead of crude oil. For this reason a scarcity of natural gases was brought about. To avoid difficulties resulting from the state refinery from the lack of natural

gas, they started mounting two large generators.

In order to increase the production of gas oil and paraffin for the requirements of the navy and of the Austrian and Hungarian state railroads, it was of the greatest necessity to increase the power plant of the state refinery. To provide for the lack of vulcan oil, required in large quantities by the state railways, the state refinery has been manufacturing 200 tons of this oil per month, beginning April, 1916.

By order of the military authorities the naphtha acids contained in the illuminating oil distillates were taken off and delivered in great purity to the military soap manufactories.

As a consequence of the increased use of sulphuric acid for the army the delivery of sulphuric acid to the refiners was for some time entirely stopped and for another period considerably reduced. As some of the oil products had necessarily to be refined and fresh acid was difficult to be got, trials were made at the state acid works of Unterhelliggenstadt to regenerate the acid on a high scale by a patented proceeding.

All possible measures were taken in agreement with the military administration to increase as much as possible the crude oil production of Galicia.

The mining authorities have established the number of workmen for each oil property and have arranged the correct distribution among them of special employees that were released from the war service. In the first place workmen were given to such oil properties as could expect production when starting again. In the second place such of the mines were considered, the bore holes of which were quite near the oil horizon.

Teutons Use Prisoners

Rumanian and Russian prisoners who formerly had been drillers were assigned to the fields, and some of the refineries operated directly under the military branch of the Government.

By the conquest of Galicia and Rumania Germany gained a tremendous oil production. Galicia is reported to have yielded between 6,000,000 and 6,500,000 bbl. last year and Rumania, 14,000 to 15,000 bbl.



German military dispatch carrier driving through the snow in East Galicia

daily, or at the annual rate of about 5,250,000 bbl., almost half the rate of production prior to the German conquest. This would make the maximum production now under control about 13,000,000 bbl. a day, as compared with 1,000,000 in the beginning.

This does not supply all the petroleum needs of the Central Powers by any means. Great Britain petroleum needs, as estimated last August, figure about 15,000,000 bbl. of crude, while in November of last year she was reported as asking the United States for more than 2,000,000 bbl. a month for her navy alone, about 11,000,000 bbl.

a year in excess of the maximum production now under German control.

A writer in the *Rheinisch-Westfälische Zeitung* of Sept. 18, 1917, complained that the capture of the Rumanian oil fields has not proved as remunerative as hoped. Competent authorities believe the Galician output has passed its zenith. Turkey has some possibilities but not immediate. Indications of petroleum were found southwest of the Dead sea before the war, and the American consul at Jerusalem reported in July, 1914, that a shipload of boring machinery and supplies were en route to Alexandria, Egypt, as preliminary to an actual test of the field. This test was never carried out.

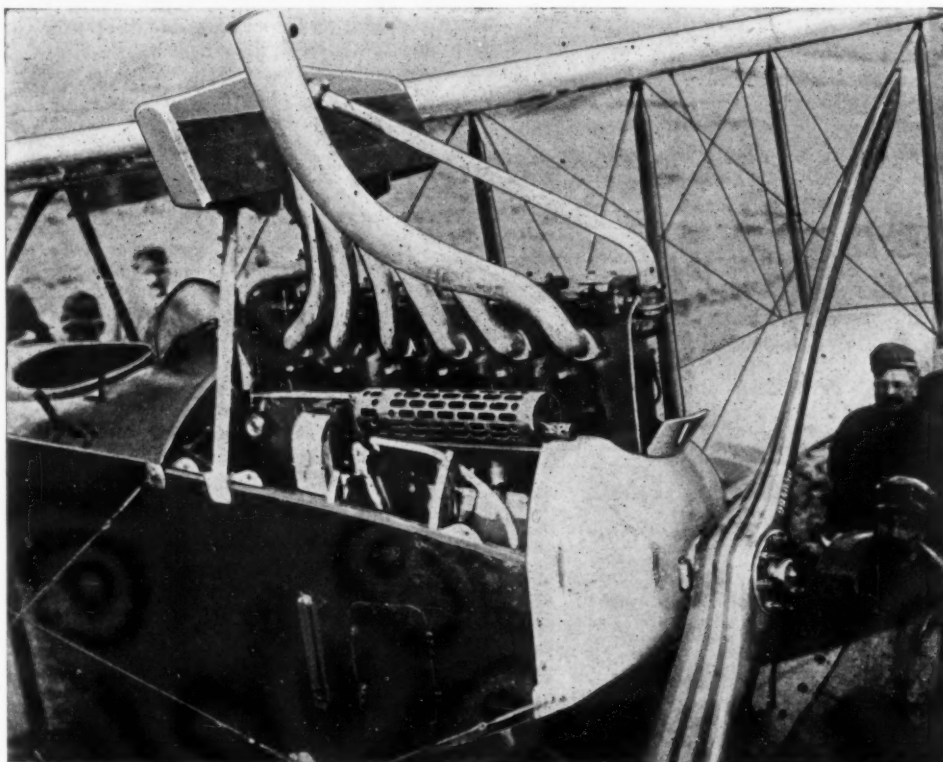
Yield in Russia

Southern Russia has important fields. In 1915 they yielded about 68,500,000 bbl. of oil and in 1914 about 67,000,000. To obtain control of this Germany would have to extend her conquest east as far as the Caspian sea or obtain sufficient authority over Russia's affairs to command the output. Operating conditions in Russian fields have grown steadily worse since the disruption of political affairs in that country, many of the wells have been closed.

Persia is another possibility, it seems, though if the Central Powers obtained possession of additional oil fields in Russia, Turkey or Persia serious transportation, as well as military, difficulties would have to be overcome. That Germany intends to maintain its control of Rumanian properties is evident from German publications, in which such statements as these appear:

What we must wish for in any case on the conclusion of peace is a guarantee for the very important financial interest of Germany in Rumania, quite apart from the free economic movement of German capital and German labor; and, further, the absolutely free export of the raw material which has hitherto been supplied by Rumania and which we shall need henceforth, and also cereals and petroleum.—*Germania*.

There can be no difference of opinion as to the fact that the sovereignty of Rumania can no longer be allowed to exist. . . . The riches of Rumania in petroleum must henceforth be placed under the definite control of the Central Powers.—*Taetliche Berichte ueber die Petroleum Industrie*.



This photograph shows the latest type of German gun operated by gasoline. The gun is fired by the pressure of the cylinders, which also operates the propeller. It fires between the whirling propeller blades, as does the new U. S. A. Browning machine gun

State Distribution of Tractors

Proves Most Successful When Undertaken
by Regular Agents

By Fred M. Loomis

Motor Age Editorial Staff

THE impression prevails in many quarters that the success which has attended the distribution of Fordson tractors in so many of the states of the Union during the last three months has been due in the largest measure to state endorsement or state participation in the distribution. This is a mistake. As a matter of fact the distribution was undertaken by the state in only one instance and in this made a comparative failure of it. Reference is had to Michigan, to which state the first allotment of 1000 Fordson tractors was made and which inaugurated the movement which since that time has spread so extensively through other states.

How Distribution Worked

In all other instances the distribution was undertaken by regularly appointed state distributors, who in turn enlisted the activity and co-operation of local distributors. In Michigan supreme reliance was placed upon a patriotic motive, the distribution being undertaken by the State War Preparedness Board, local county chairmen or county agricultural agents being relied upon for the ultimate distribution. The state board had no adequate business organization nor any business connections competent to handle such a purely commercial transaction as the sale and distribution of 1000 tractors within the period of one month. Upon the other hand, subsequent state distributions were in the hands of trained business men who had something like a comprehensive conception of the difficulties which likely would be encountered and who knew also how to meet them effectively and who at the same time could appeal for assistance to a local distributive agency which already was in existence and which was accustomed to meeting just such problems as those the tractor distribution brought to it. This readily explains the comparative failure of the distribution in Michigan and accounts for the phenomenal success which attended state distributions elsewhere.

But even so, success hardly could have been attained anywhere in equal measure had it not been for influential factors commonly absent from commercial transactions of the magnitude and nature of the state distributions of Fordson tractors. These factors were, but not necessarily in the order of their importance:

- Patriotism;
 - State approval, active or tacit;
 - Henry Ford, his personality and standing with the farmers of the country;
 - The character and ability of the state distributors;
 - The character, ability and disinterestedness of the local distributors.
- First as to the patriotic motive. Much has been made of the sentiment of patriotism behind the increased production of tractors and their immediate employment on the farms of the country in order that the food products of the country's acres

might be increased. This has been put up to the tractor manufacturer as a duty he owed his country and that under the circumstances it was incumbent upon him to exert himself to the utmost of his productive capacity. Most of them have responded to the best of their ability, but comparatively few were fortunate in having a production large enough to undertake distribution on a large scale, or to consider any plan of distribution other than the usual one of selling through their regularly constituted agents. For this reason the patriotic appeal rather failed of its effect, generally speaking.

Impetus was given the patriotic movement, however, when announcement was made by Henry Ford that his production at the Dearborn factory was such that it would be possible for him to make state allotments of tractors in numbers as large as 1000 to a state, provided they could be distributed immediately to the farmers at factory price. This proposition first was put up to Michigan and was eagerly accepted by the state government, who placed the state distribution in the hands of the War Preparedness Board as previously stated, and with results as already given. That the plan succeeded only in part in Michigan was because the patriotism of the farmers could not altogether make up for a lack of business organization in the distribution.

Exactly the same sentiment has been appealed to in every subsequent state distribution, but in each case it has been supplemented with business organization and for that reason has been more successful. Aside from the effect the patriotic motive may have had upon the farmers in inducing them to buy tractors even in the off season, its most significant and important effect has been to induce dealers to undertake the financing and distribution of the tractors themselves without the hope of immediate individual profit. It is doubtful if even motor car dealers could have been induced to do this unless their patriotism had

Misrepresentation!

MOTOR AGE is in the receipt of the following:

"There is a man going the rounds of all garages representing to be selling plating material for reflectors and motor car parts. He claims to represent R. Wallace & Sons and the Associated Plating Co. Will you ask your readers to notify us or the Wallace & Sons Plating Co., 10 South Wabash avenue, Chicago, in case this man shows up. This man is a fake and this is his second time. He worked the same thing several years ago.—Stevens Battery Shop, Peru, Ind.

been thoroughly aroused, hence to this sentiment must be attributed a large share of credit for the success which has been attained.

The same sentiment accounts, also, for such recognition, approval or sanction as has been accorded the plan in the several states by the respective state governments. As stated before active participation was confined to one state alone, Michigan. The results there were very unsatisfactory and disappointing. In some of the other states more or less sanction and encouragement has been given by the state government. In some no official cognizance has been taken of the matter whatsoever. However, state distributors have shrewdly seized upon every atom of recognition or encouragement and upon every indication of state approval and have used it everywhere for all it has been worth. Probably it is this fact that has occasioned the widespread impression that state encouragement and assistance was given everywhere. It is not improbable, indeed, that what was intended to be a mere tacit recognition of the service the state distributor was planning to do has been magnified by the latter into an expression of active approval. This has resulted here and there in placing the state government in rather an embarrassing position.

Farmers Esteem Ford

However this may be, the impression is general that state distribution has received state sanction and approval, and that this has had an appreciable effect in making state distributions successful.

The estimation which farmers in general entertain regarding Mr. Ford as a man, an admiration among the same element for his manufacturing and merchandising abilities, constitute a factor of tremendous influence. For several years there has been persistent rumors that Ford was about to produce a low-priced, practical tractor, and farmers all over the country have been agog to welcome it. As soon, therefore, as announcement was made that the long-expected tractor was ready for distribution at factory price and that it was available in large numbers, farmers literally fell over themselves to get one. Irrespective of the fact that the price as announced was higher than most had expected it to be; irrespective of the fact that the Fordson tractor was an untried quantity as far as its effectiveness was concerned, the farmer, individually and collectively, was predisposed to accept it on faith and to buy it unsight and unseen. This was just because it was made and vouched for by Henry Ford.

After making all due allowance for the force of patriotic impulse, and allowing all that is possible for the ability of state and local distributors, it is doubtful if any other tractor of any other make would have sold so spontaneously as did the Fordson. This, more than state assistance or any

other influencing factor, accounts for much of the success that has attended the attempt to put the Fordson across. Furthermore, if Ford's tractor meets expectations and stands up to its work this factory will be a permanent one and one which every manufacturer of tractors must take account of in a competitive way.

The character of the men who have been chosen to act as state distributors is still another powerful factor. The very manner of their choice establishes this fact. The state agency was not offered to them. The man who got it went after it, and manifested his fitness for the post by doing so. He demonstrated that he had the foresight to see an opportunity and to seize it. He gave promise also by the same act that he had the ability to make the most of that opportunity. Thus the test for fitness in the ranks of state distributors was the promptness displayed in getting on the job under the profitless conditions imposed, supplemented by the applicant's previous record as a successful distributor of the Ford motor car. This method of selection insured loyal co-operation, energetic action and willingness to undertake a big task without hope of compensation, save as the future might promise recompense.

Selection of Local Agents

Practically the same plan of selection for local distributors has been followed. The state distributor announced the plan of profitless local distribution to all the Ford dealers in his state, appealed to their patriotism and pointed out the future possibilities of the tractor trade. Those dealers who responded promptly and heartily, who pledged their co-operation and their dollars, got the appointment. This actually was a process of selection whereby the most capable and most energetic dealer

in the organization obtained the agencies.

These then are the prime factors which have contributed to the success which has been attained in the attempt to distribute thousands of Fordson tractors, which has resulted in putting hundreds of motor car dealers into the tractor business, most of them doubtless permanently, which likely will result eventually in what practically will amount to a veritable revolution in the farming equipment business, at least as far as power farming equipment is concerned.

Henry Ford & Son have sold every tractor which has been included in the numerous state distributions at the uniform price of \$750 f.o.b. Dearborn, Mich. This is the full factory price and as far as Henry Ford & Son are concerned not a cent of their factory profit has been sacrificed.

These same tractors have been passed along to the farmer at the same price, plus a freight, unloading or service charge, which has varied from \$15 to \$25, according to the distance of the point of delivery from the factory. This means that the state distributor has not made a single cent of profit on the tractors themselves, nor have the local distributors, except insofar as the latter have been able to save a few dollars here and there out of the freight or service charges. This has been the remarkable feature of the whole distribution and is the effect of the patriotic sentiment and of the hope that future trade will bring compensation for present profitless effort.

Both state distributors and dealers have made some profit on Fordson equipment, the division between the two varying according to the plan pursued in the several states. However, the profit made on the equipment by either state distributor or local dealer has not been as great as farm

equipment dealers are accustomed to making, nor would it have been sufficiently attractive to the old-time farm equipment dealer to have induced him to undertake and to accomplish what the motor car dealers of the country have done.

SUPPLY MOTOR TRAINS MOVING

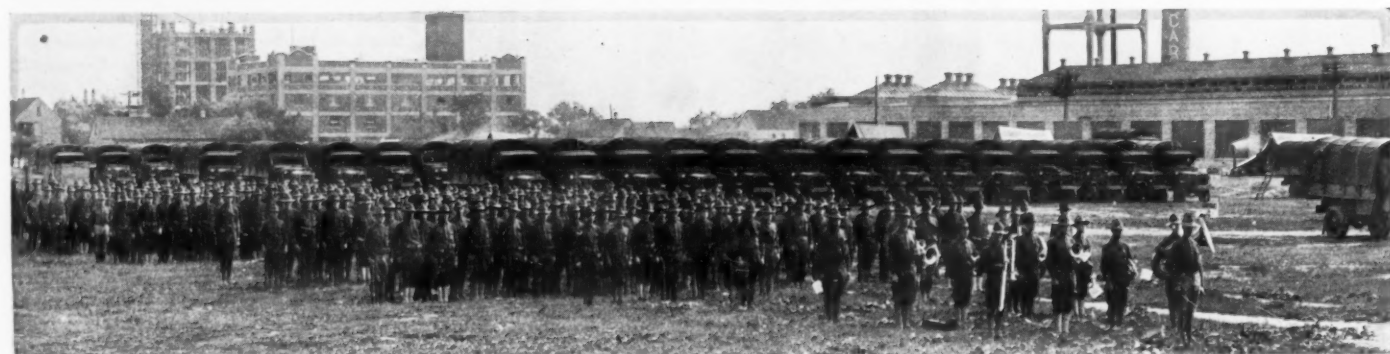
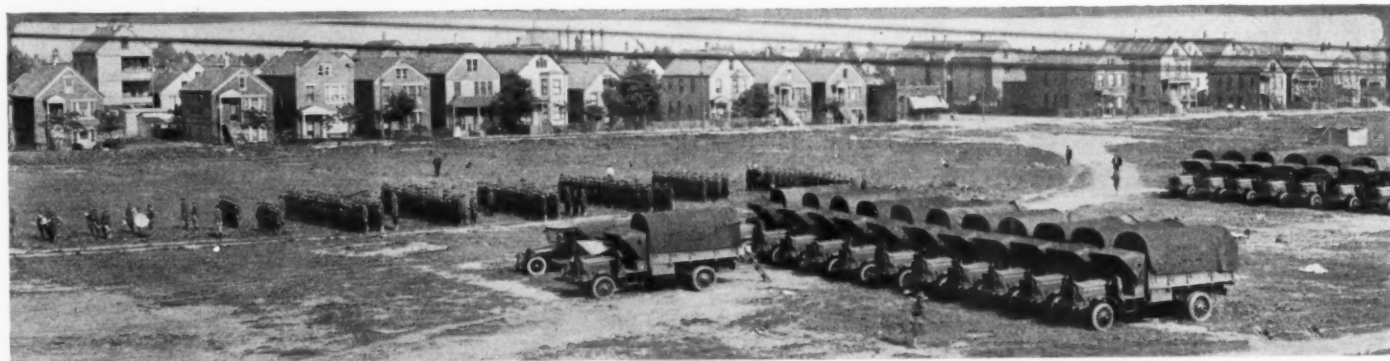
Chicago, June 10—Motor supply trains en route from Camp Grant, Ill., to Camp Holabird, Baltimore, Md., are moving. The first left Camp Grant Saturday and is in Chicago now. Approximately 500 men are in the command, which is under Maj. Hays McFarland. Among the men is Nelson Morris of the big packing company, who is a private and one of the truck drivers. The trucks in camp service came to this city overland, while other trucks will be requisitioned here, where many of the Army trucks are being assembled, and all of them driven overland to the seaboard.

The train includes 186 Liberty trucks and thirteen motor cars for officers, besides ninety-nine motor vehicles of other classes.

NEW FORDSON EQUIPMENT

Chicago, June 7—A grain binder, a small threshing machine, a wood saw outfit and a power feed grinder, for exclusive use with the Fordson tractor, are being developed at the Ford tractor factory at Dearborn, Mich. It is understood that a silo filler and equipment along the lines of grain seeders and drills likewise will be undertaken.

These are in addition to the engine plow and the engine disk harrow already approved and which are being made respectively by the Oliver Chilled Plow Works, South Bend, Ind., and the Roderick Lean Mfg. Co., Mansfield, Ohio.



Motor supply train in formation. Part of the trucks have been in service at Camp Grant, while others are those assembled in Chicago. The train is bound for Baltimore and the large depots there

Mechanical Construction of Ignition Magnetos

By H. R. Van Deventer
Manager Sumter Electric Works

FIGURE 1 shows an eight-cylinder airplane type of magneto with covers and distributor removed. In addition to furnishing ignition current, this magneto furnishes current for the wireless.

Fig. 2 shows a magneto and distributor for use on motors of the La Rhone and Gnome type. This magneto produces two sparks per revolution, is driven two and one-quarter times engine speed on a four-cycle, nine-cylinder motor.

Fig. 3 shows a magneto used with separately driven distributor and employing a small high-tension magneto for starting. This outfit is used on twelve-cylinder engines having 45 deg. angle between the two rows of cylinders. The magneto operates one and one-half times engine speed, producing sparks at 62½ deg. and 112½ deg.

This same magneto is made to operate at engine speed producing six sparks per revolution at equal angles of 60 deg. and when used on twelve-cylinder engines of conventional design the distributor may be mounted on the camshaft, thereby eliminating the distributor gear commonly incorporated in the magneto.

Universal Ignition Plan

The universally adopted plan of ignition for airplanes contemplates the use of two magnetos for each motor, each magneto producing a spark in each cylinder at the same time. The magnetos are commonly set on the motor so that the spark occurs from 23 to 28 deg. ahead of the dead center position. Some idea of the general arrangement of the magnetos on a modern airplane engine will be gathered from Fig. 4. Fig. 5 shows a complete wiring dia-

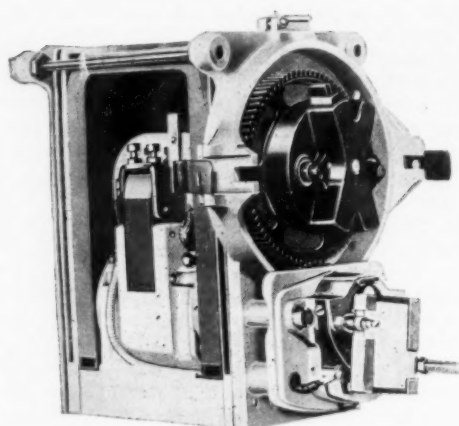


Fig. 1—Eight-cylinder airplane type of magneto with covers and distributors removed

gram from an airplane motor, including radio connections.

From the foregoing hasty review it will be noted that to meet the requirements of internal combustion engines magnetos must be of many sizes and types. This should be kept in mind when considering the following data which is of necessity general in its character. There are certain points necessary from a mechanical standpoint that must be given careful consideration in any magneto whether it is intended for use on a stationary engine for the farm used occasionally and making a few hundred revolutions per minute or in battle airplanes running for hours at high speed. In addition to these general requirements, each size and type of magneto has certain meechan-

ical details worthy of careful study. These details, however, it is impossible to cover in a paper of this character.

All magnetos have magnets. Prior to the war, steel containing 5 per cent tungsten was used, but during the past two years chromium steel has been used with entirely satisfactory results so far as the life and efficiency of the magnets are concerned. The chromium steel is somewhat harder to work than tungsten.

The customer must take the magneto manufacturer's word as to the tempering, magnetizing, etc., and can do little more than inspect the magnets for workmanship, see that they are properly formed and ground to fit the pole pieces of the magneto and that the grinding has not drawn the temper.

In the majority of low-tension magnetos the magnets are attached to the pole pieces by screws, and it is preferable that some means be employed to seal at least one of these screws so that the magnet cannot be removed from the magneto without breaking the seal, thereby evidencing that the magneto has been tampered with.

Magneto manufacturers know that the majority of cases where magnets are reported dead are due to two causes. The first and 99 per cent of the trouble reported is due to battery having been connected to the magneto, thereby demagnetizing the magnets. The second cause is because the magnets are taken off the magneto without a keeper being applied or are replaced wrong.

Latest Magnetizing Practice

While methods of magnetizing do not come exactly within the scope of this paper, it is thought that the latest practice in this connection will be of interest and Fig. 6 shows a magnetizing coil with master magnet in place. These coils are supplied by the magneto manufacturer and are designed for various voltages, direct current being used in all cases, usually 110 volts.

The coils are connected up and marked so that the N and S poles are known, and all magnets of a certain make of magneto should be magnetized in the same direction. The magnet to be magnetized should be connected to the one in the coil and pushed forward so that it is covered by the coils, as shown in Fig. 7. The switch connecting the coils to the source of current should then be thrown in one second and opened while the magnet being magnetized is in the coil, as shown.

After the switch is opened the magnet being magnetized should be pulled forward and before separating it from the one in the coil a keeper should be placed across its poles, as shown in Fig. 8. This keeper should not be removed until the magnet is in its position on the magneto, as shown in Fig. 9.

It will be found that magnets properly

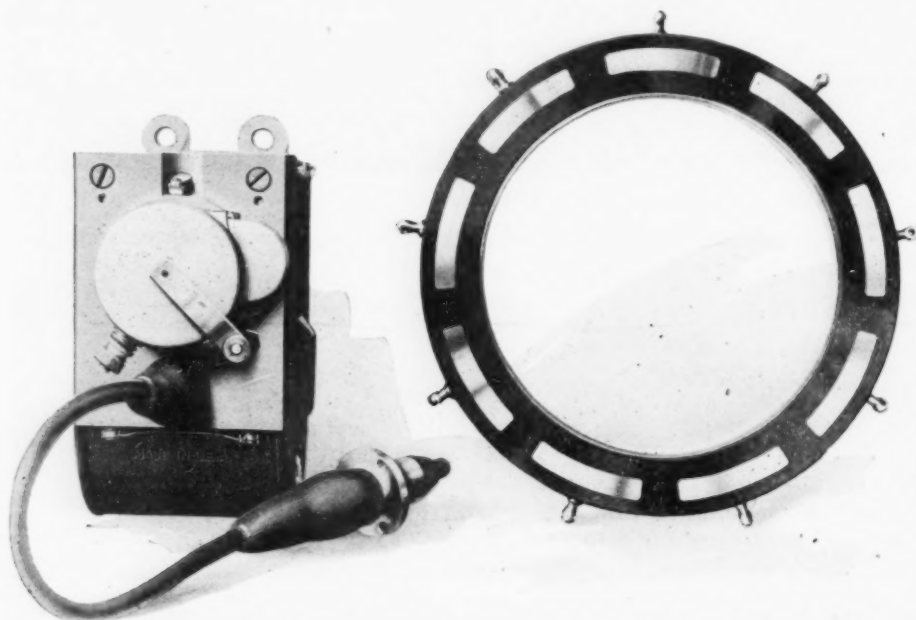


Fig. 2—Magneto and distributor for engines of the La Rhone and Gnome type

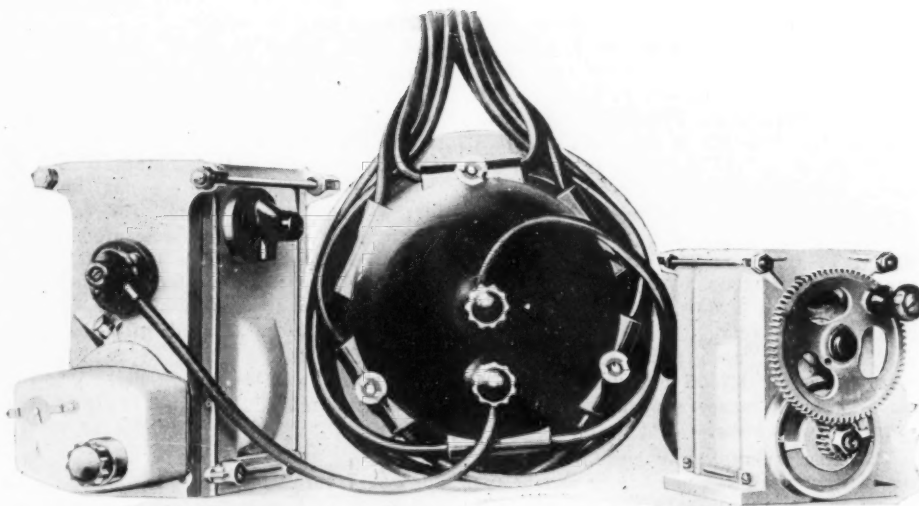


Fig. 3—Magnetos used with separately driven distributor and employing small high-tension magneto for starting

magnetized and not subjected to any mechanical abuse will retain their strength indefinitely unless battery is passed through the windings of the magneto.

The question of design of the magnet proper is of considerable importance to the purchaser. As a general rule magnets having a considerable distance between their poles are more liable to short life than magnets in which the poles are closer together. Practically all modern makes of magnetos of the rotary high and low-tension types have well proportioned magnets.

Turning now to the pole pieces and the coil of the core in magnetos of the Dixie type, or to the armature and pole pieces in the shuttle wound type; these parts, from a mechanical standpoint, do not offer much interest to the purchaser. The magneto manufacturer must secure the proper grade of iron and treat it properly or it will not be electrically efficient. The purchaser should note, however, that the air gap between the armature and rotor or pole pieces, is as close as consistent with good mechanical practice, and that the construction of the armature or rotor and its bearings is such that this air gap will be maintained at all speeds and during the life of the magneto.

Two Magneto Bearings

The magneto bearings are divided into two classes, plain and ball. Plain-bearing magnetos are usually those of low-tension variety, although there are several models of plain-bearing high-tension machines recommended for stationary engines of ordinary speeds, as there is no need of putting in expensive ball bearings where they are not required.

The life of the plain-bearing machine seems to be entirely dependent on the treatment the magneto receives; the purchaser should see that the oil holes are provided with suitable covers and the best low-tension models are equipped with oil pots adapted to hold non-fluid oil, so that when once filled the magneto will run several months without attention. Wick oilers are used on the larger models and afford efficient and reliable means of lubrication. Lack of oil will cause the magneto shaft to stick and break.

Turning now to the ball bearing types, we find that practically all magnetos for high-speed engines such as aero, auto, etc., are so equipped. In some cases ball bearing distributors are used. The usual methods of oiling are employed on most models. In some magnetos for relatively slow speed work the bearings are packed with grease and put into the magneto and no provision is made for ever oiling them afterwards. It is found that such bearings will give good service when properly protected from dirt.

The windings on modern magnetos give little trouble if properly manufactured. In connection with low-tension models, the customer should take several of the samples submitted, have the armatures unwound to see that the winding is laid on in smooth layers and properly insulated from the armature core. When armatures are loosely wound the wire may slip, thereby causing short-circuits or binding of the armature.

Shuttle type armatures have a clearance of about 0.005 in. The annual bearings are subject to wear from the following causes:

A broken ball will cut the ball races and in turn cause the armature to rub against the pole pieces.

Lack of lubrication in either of the bearings will cause the bearings to cut and roughen. A new bearing is the only remedy.

The ground brush may be missing or dirty, causing the ball bearings to become pitted and rough.

The back plate screws may become loose from excessive vibration, causing the armature to stick with a resultant breaking of the driveshaft.

The coupling may not be flexible and cause the bearings to wear sideways. The armature will rub on one end. This also may be caused if the magneto is too much out of line.

The bottom bolts may be drawn up too tight, causing the case plate to spring, with the result that the bearings are run tight and are ruined.

The twisting of the armature out of line may cause the winding to rub and chafe, grounding the winding.

Screws May Be Loose

The four screws holding the armature heads may become loose or shear from the twisting strain and wreck the armature.

The driveshaft may become loose, due to tight bearings or too great a magnetic pull or faulty construction, especially if the drive end is made from other material than manganese bronze.

In connection with the windings and small insulating parts of the magnetos, through which the high-tension current is conducted, a testing outfit, shown in Fig. 10, is of considerable value. Referring to this sketch a 12-volt battery is used and when operating switch A is closed, completing the battery circuit through the vibrator. The safety gap is set at $\frac{1}{16}$ in. In testing out a part which carries a high-tension current, for instance, a spark plug cable, connect the wire M to the wire of the cable and pass the wire L along the outside over the exterior surface of the rubber. Any rupture is very easily found in this way. The same rule also applies to testing leaks in distributor spools, such as

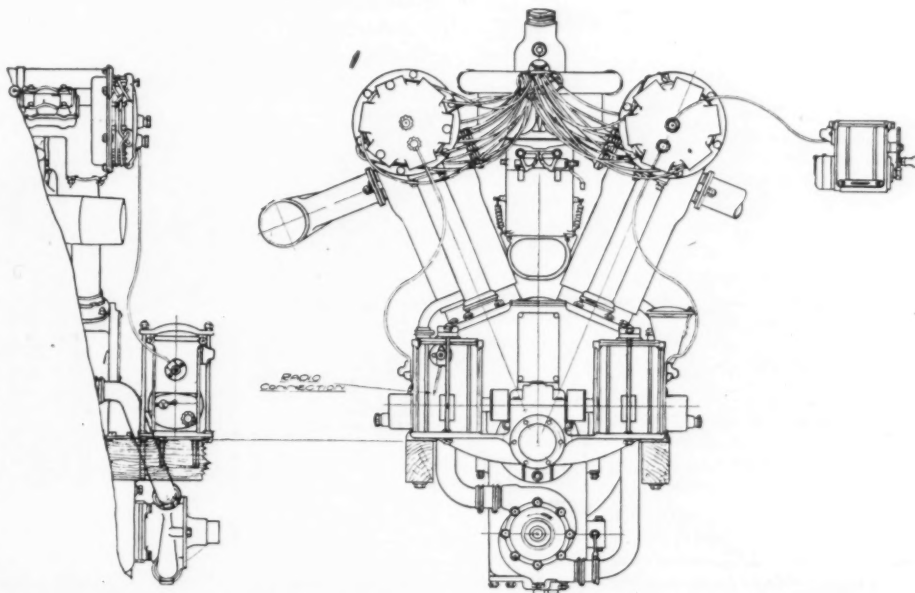


Fig. 4—Plan of general arrangement of magnetos on a modern airplane engine

that shown in Fig. 11, one wire being connected to the brass segment and the other being passed all about the insulation surrounding the segment. This is really nothing more than a mechanical test, as any crack in one of these spools will render it useless. Trouble here is often due to the surface on which the brush bears becoming rough. It should be smooth.

The interrupter mechanism, or, as it is commonly called, the breaker, will now be considered. This is usually mounted about the end of the magneto shaft and consists of a movable contact member adapted to open and close the primary circuit of the magneto. This interruption may take place once per revolution, or a number of times per revolution, depending upon the number of cylinders the magneto is to supply and the shape of the cam. It is very essential that the points separate when the rotor or armature is in a certain position in relation to the pole pieces. This will be clear from a reference to Fig. 12 in which is the gap between the edge of the rotor and the pole H. The setting data for the opening of the contact points in relation to the distance is given in Fig. 12.

Using Test Buzzer

As it is difficult to judge just when the contact points in a breaker open, as a movement of even so little as 0.01 in., which the eye cannot see, breaks the circuit, it is best to use a test buzzer as shown in Fig. 13. The magneto shaft is revolved, indicated by the arrow on the oil cap, which is the running direction of the magneto. While the contact points are closed the buzzer

circuit is closed and the buzzer will operate until the contact points open. Just at that instant when the buzzer ceases to operate, stop turning the magneto shaft and use a thickness gage, as shown, to measure the gap X. There is no adjustment more essential than this one if the most effective performance of the magneto is to be secured, and it is obvious that only through correct mechanical work can this accurate adjustment be obtained.

Fig. 14 shows another important part, the breaker arm or lever, common to all magnetos. It is seldom that the platinum points will be found defective. Sparking at the points is usually due to oil, misadjustment or a defective condenser. The main thing is to see that the points are clean and not loose.

The fiber bumper may become loose in the breaker arm, and purchasers should examine this part very carefully to ascertain how the bumper is secured in place and that it can be removed in case of wear. New bumpers always should be filed to fit the cam. That edge which the cam first comes in contact with should be filed until the contact points separate, when the gap between the rotor and pole pieces is in accordance with limits given by the manufacturer.

The breaker construction must be such that the breaker bar cannot become tight on its stud and thereby stick in the open position. Sometimes this occurs due to insufficient lubrication and Dixie magnetos have the breaker bar mounted on a hollow pin, which communicates with an oil hole

in the edge of the breaker box, through which oil may be applied.

Breaker boxes on most magnetos are movable for advancing and retarding the spark, and on machines where the breaker box only is moved attention should be paid to the way the box is secured, so that it will move easily without binding and at the same time not wobble about the cam. In the Dixie-type magnetos, for variation ignition, the breaker box is secured to and moves with the field structure, and, therefore, a sticky breaker box is impossible. This feature also enables the same degree of intensity to be secured with the magneto, either full advance or full retard, as the relation of the gap X, Fig. 12, to the time of opening of the points is always the same regardless of the advance or retard position.

Contact Points Opening

See that the contact points open 0.020 in. on all models except Dixie 120, which should be 0.018 in. When the buzzer ceases to operate the contact points have opened; distance, X, should be from 0.015 to 0.035 on models D 40, 44, 60, 64, 80, 81, 120 and M-1 and M-2 180-deg. Dixie M-2; 0.005 to 0.015 on No. 1 break of models, 42-45-55 deg.

The troubles arising from mechanical defects in circuit breakers are numerous and may be caused by the following:

Insufficient lubrication of the breaker lever, causing it to stick and corrode.

A loose breaker bar bearing stud, due to faulty riveting.

Breaker bar bearing stud too small in

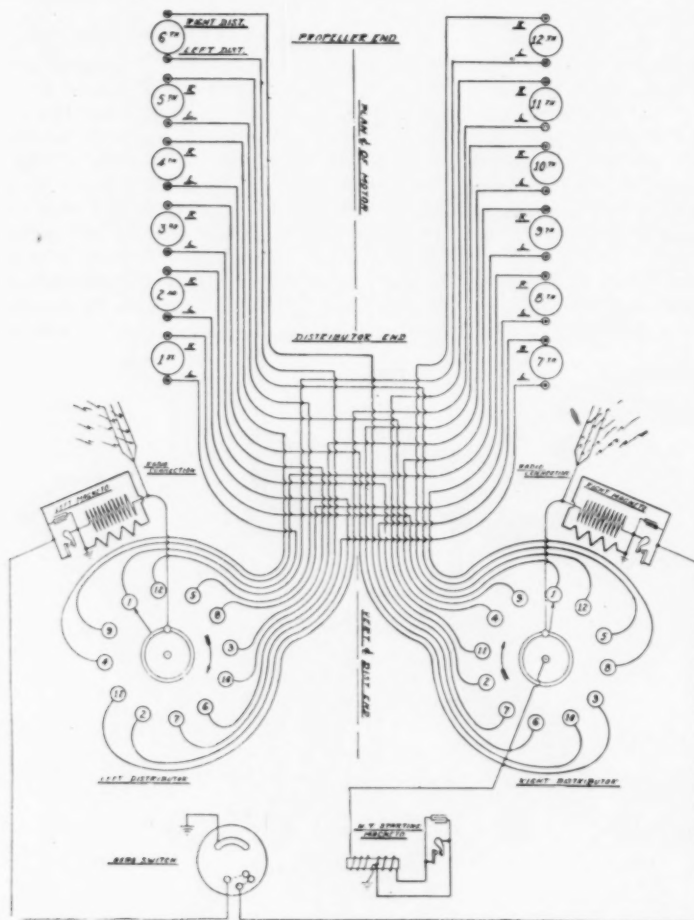


Fig. 5—Here is shown the complete wiring diagram from an airplane engine, including the radio connections

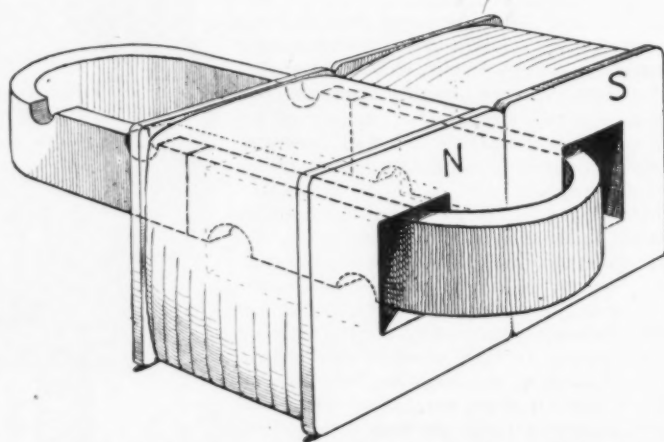
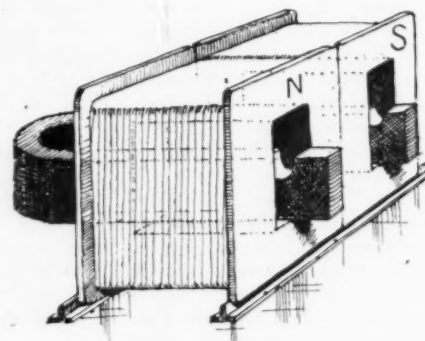


Fig. 6, above—Magnetizing coil with master magnet in place.
Fig. 7, below—Location of magnet to be magnetized

diameter, causing undue wear in the breaker lever bearing.

Breaker bearing stud too large in diameter, causing breaker lever to stick.

Breaker bar bearing stud or breaker lever wearing, due to electrolysis.

Undue fiber bumper wear, the cams being too abrupt or too rough.

Breaker lever too heavy or out of proportion will cause the bearing to wear rapidly.

A breaker lever spring that is too stiff will cause the bearing and contact points to wear.

Fiber cams will wear rapidly, due to dust entering the breaker housing.

In a revolving breaker the breaker lever bearings are sometimes made of fiber, which will cause the breaker lever to stick under atmospheric changes.

The insulating bushings of the contact screw bracket on a revolving breaker become cracked from heat, causing these parts to become loose.

Revolving breakers that revolve left hand and have a right hand screw or threaded bolt holding the breaker in place often become loose and wreck the breaker or fall off and become lost.

The greatest wear is usually in the breaker housing bearing, caused by road dust working in or the advance lever rod being too stiff or out of line. A loose housing will cause the contacts to break out of time.

Various Trouble Causes

The fiber bumper may become loose from shrinkage or faulty fastening.

The contact points may become loose in breaker bars, or the breaker bars may become bent, due to light construction.

The breaker bar may become crystallized and break.

The ground connection of the breaker bar may be poor.

Revolving breakers become loose and turn, destroying the relation of the circuit breaker to the magnetic break.

Using a breaker base fastening screw that is too long, puncturing the condenser or breaking the screw off.

Breaker fastening screws that are too large in the thread cut like a tap and fill up the inner end of the breaker sleeve with brass chips and short it.

Revolving breakers not running true will cause incorrect breaking of the contacts and wear the cams.

A condenser is used in high-tension magneto and consists of many layers of mica, between which tin foil is laid so that each layer of tin foil is electrically insulated from its neighbor.

The purchaser can do little toward satisfying himself as to the quality of mica condensers. This is more a question which concerns the magneto manufacturer. Fig. 15, however, shows how the condensers may be tested electrically. There should be no electric current through the condenser when the switch is closed and, therefore, the lamp should not light. If the lamp is lighted then the condenser is defective. The condenser shown in the illustration is from the Dixie magneto and is arranged to

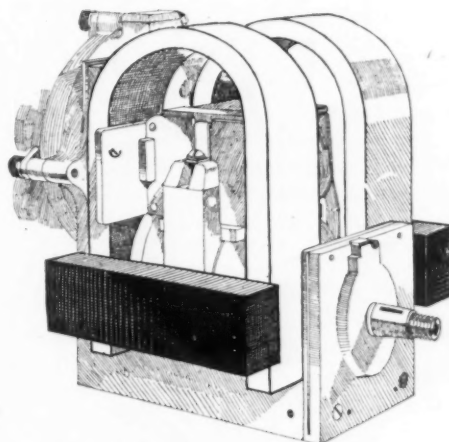
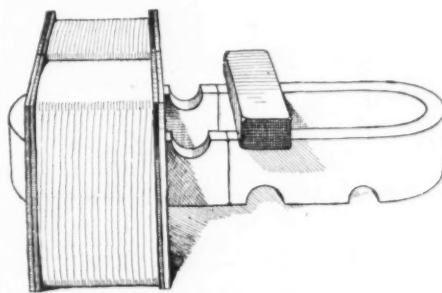


Fig. 8, above—Keeper placed across magnet poles. Fig. 9, below—Keeper removed with magnet in position on magneto

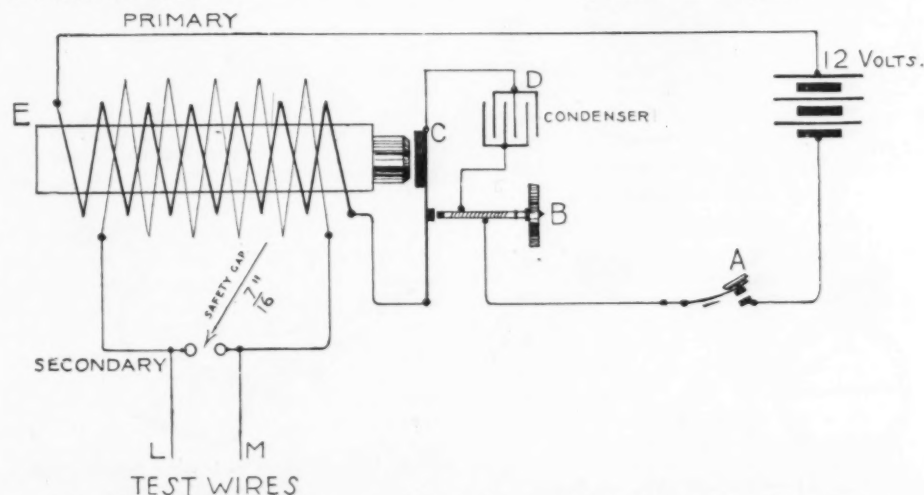


Fig. 10—Testing outfit for use with windings and insulating parts of magnetos

be easily removed and replaced. This feature is not met with except in magnetos of this type. Condenser trouble is rare in modern magnetos, and manifests itself in flashing at the points and failure of the spark.

The distributor, whereby the spark produced by the magneto is distributed to the several cylinders, should receive careful attention, for here mechanical defects are often found. In the first place the material in a distributor should be of high insulating quality, should be impervious to moisture, readily cleaned and not affected by heat. It should also be mechanically strong to withstand abuse to which it is often subjected.

No attempt will be made here to discuss the relative merits of distributors, in which there is a single traveling brush as compared with those in which there is one brush for each cylinder and a single traveling contact, nor will the gap type of distributor, in which a rotating finger passes near a terminal for each cylinder, a gap intervening, be discussed, as such arrangements merely side-step the distributor problem. An actual contact in the distributor is necessary and, while gap distributors eliminate brush trouble, they introduce other evils much greater.

Inspection by Customer

The various parts of the distributor should be inspected by the customer, to determine whether or not they are properly proportioned. For instance, the length of the contact segment in the distributor disk is a matter of vital importance, and some manufacturers in their endeavor to offer a distributor having a very limited amount of travel, or to squeeze a twelve-cylinder distributor into very small limits, have shortened up the contact segments.

Distributor bearings usually go bad from lack of adjustment, if they are ball bearing, and the shock of the armature flux reversal.

Wear on bronze distributor bearings usually is caused by poor lubrication and the accumulation of dust from carbon brushes, etc.

Clogging of the oil duct leading to the discharge bearing and the dirt in the oil cup which finds its way in the bearing when the magneto is oiled.

The insulated distributor parts may be out of balance and cause the bearing to wear oval.

The thrust button spring may have too much thrust, causing too much end thrust on the bearing, causing it to heat and stick.

Bearings of a graphite material or oilless bearings have been tried with poor results, owing to the softness of the bearing material; they are also very noisy.

Adjustable distributor bearing plates may become loose, causing bearing wear from too much back-lash or meshing the gears too tight.

Distributor shafts that are hollow and carry fiber or hard rubber secondary connections; these parts may be out of line or sprung, causing wear in the bearing.

An unusual amount of wear is due to the rough surface of an unfinished distributor shaft when plain bronze bearings are used.

When plain bearings are composed of other metal than bearing bronze, they wear rapidly and become noisy and chatter.

In regard to the purchaser making tests

of magnetos. In the case of mechanical defects these are usually found, from an inspection by a competent person and in low-tension models, mostly consist of broken and bent shafts, cracked magnets and stripped threads in the bolt holes in the case and, in addition, on high-tension machines, cracked or loose distributors, breakers loose or out of adjustment, distributor fingers or brushes missing or broken.

For those who desire to test a high or low-tension magneto before purchasing, would say that no test will equal that of actual service. Take twenty-five machines and put them out on the line of engines on which they will be used and let them go into the hands of the ultimate user and watch results.

The magneto manufacturer uses certain mechanical tests which, in connection with low-tension magnetos, usually consists of short-circuiting the magneto and running it for several hours at a speed of 400 to 500 r.p.m. This initial short-circuit will knock the magnetism of the machine down as low as it will ever go, and, if there are any tight bearings or other mechanical defects, they usually develop during this run. The machine is then taken off and tested electrically and finally is connected up to make-and-break igniter and the spark visually observed.

Testing High-Tension

The testing of a high-tension magneto is somewhat more difficult, and in the case of a Dixie four-cylinder machine, for instance, the magneto is first oiled. Then the distributor wires are connected to individual spark plugs set $3/16$ in. Then the magneto is run 40 min. at 1500 r.p.m., with timing lever full advance and 10 min. at 3500 r.p.m., full advance, and 10 min. 150 r.p.m., noting that it runs equally well during last run in either advance or retard position.

During these runs the contact points should not spark or flame excessively. There should be no excessive noise or stray sparks detected about the magneto. The safety gap in the magneto should be $1/8$ in. and should not spark at any of the above speeds.

See that the shaft of the magneto turns freely at the end of the test, making sure to distinguish the magnetic pull from any binding of the rotor.

Examine the breaker bar to see that it moves freely. See that the platinum points come together squarely, line up and are free from burning or blackening. Check up the opening of the points and see that it is as specified by the manufacturer. See that the bumper is running evenly over the surface of the cam and that excessive wear is not noticeable on either cam or bumper.

Make sure that the distributor gear turns freely and that the oil feeds in through the cup, reaching the bearing properly. Examine the distributor disk to see there is no heavy carbon deposit and that brushes are running evenly over the surface of the disk.

Reject the magnetos in which carbon brushes run only on one side and reject any magneto which fails on the requirements or in any part not mentioned shows excessive wear.

The mechanical tests for twelve-cylinder Dixie magnetos are practically the same, except they are first driven 40 min. at 3500

r.p.m., 10 min. at 4500 r.p.m., and 10 min. additional at 150 r.p.m.

In addition to the foregoing running tests, the following is a sample of the general inspection to which the magneto should be subjected, this applying particularly to the Dixie four and six-cylinder magnetos.

Observe the general appearance of the magneto exterior finish, marking off rotation, fitting of covers, breaker box, etc. See that the rotation and advance lever or

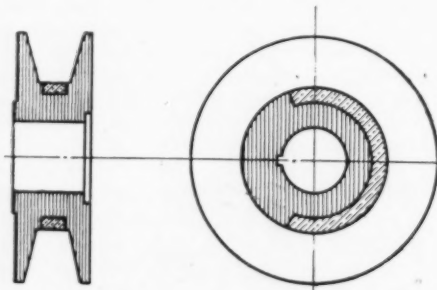


Fig. 11—Testing leaks in distributor spools

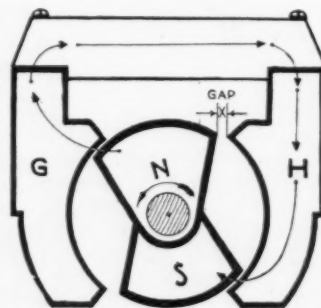


Fig. 12—This shows the opening of contact points in relation to distance

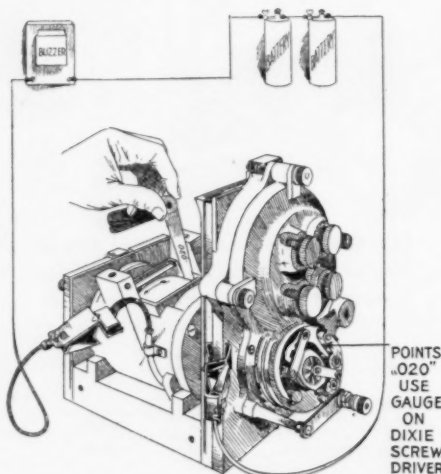


Fig. 13—Using test buzzer to judge when contact points open

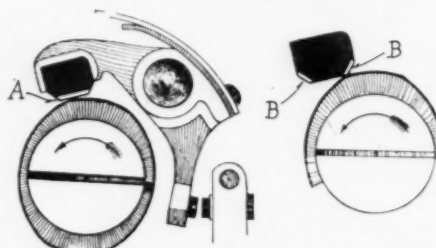


Fig. 14—Breaker arm, or lever

any special features correspond to the customer's specifications.

Check taper of shaft and location and size of key way. See that the holes in the base conform to specifications as regard size and location and that they are tapped perpendicular to the plane of the base. See that all screws and nuts are tight and lock washers in place; that no screws are missing from the breaker box. See that the breaker arm moves freely and the platinum points line up and that the breaker arm does not strike the cam at any other point than the bumper. See that the end play in the field structure does not exceed .004 in. The advance lever should move freely and should not require more than 3 lb. suspended from the hole in the lever to advance or retard it fully.

Try the carbon brush springs to see that the pressure is soft.

See that the breaker cover spring fits tightly.

In conclusion, the statement made in the first part of this paper may be reiterated, that mechanical defects and the failures due thereto form by far the largest part of magneto troubles.

Difficulties in Making

The magneto manufacturer has been up against many difficult problems, not only in meeting the requirements which have ranged all the way from the man who wants a magneto for a sixteen-cylinder engine, said magneto to produce two sparks for each cylinder, which would mean a thirty-two-point distributor, to the man who wants a good high-tension magneto for his farm engine for \$3.50, but also on account of having been limited both in dimensions and weight. All things considered, the magneto is truly a wonderful piece of equipment, producing as it does around 30,000 volts and, in some cases, as many as 18,000 sparks per minute. This voltage is much higher than that produced in any electrical equipment of the same size, and the speed necessary to make 18,000 sparks per minute means that the breaker arm of the magneto must make over 300 vibrations per second, which is about the note middle C on the piano scale.

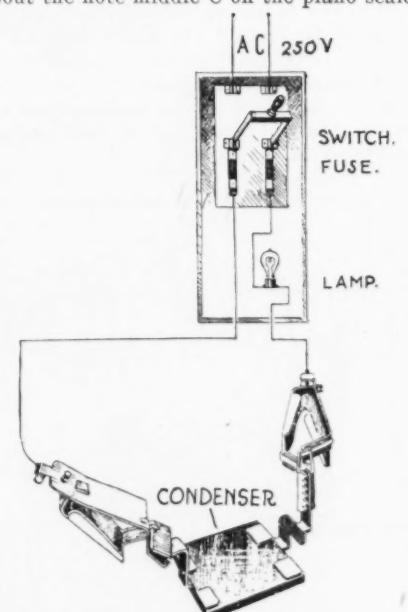


Fig. 15—Method of testing condensers electrically

To Teach School Children Traffic Safety

FOURTEEN common sense rules have been laid down in a traffic safety questionnaire to be used as the basis of teaching school children traffic safety methods in Akron, Ohio. The plan is built around a course in a campaign arranged by the Akron Automobile Club, the director of public safety and the Akron executive of the Boy Scouts.

The Boy Scouts are asked to study the rules which are contained in the following questionnaire and then they are given an examination before their Scout master. A Scout credential card signed by the Scout master and countersigned by O. W. Baum, director of public safety; Secretary Grover

Reese of the Akron Automobile Club, and Joseph W. Taylor, Scout executive, is presented to the boys who pass.

After their training, it becomes the duty of the Boy Scouts to watch for violation of these rules by other school children and warn them of the necessity for public safety. After a scout has called the attention of eight children to violations of the rules he is entitled to a medallion for public service.

This is a plan that could be adopted all over the country with the best of results. It could be used by schools, motorists and pedestrians with excellent results, as throughout the questionnaire points toward traffic safety methods. The questionnaire follows:

Traffic Safety Questions and Answers

1—What should you do before crossing a street?

I should stop and look both ways, first to the left, as danger will likely be nearer from that side, and then to the right. If the street is clear for at least half a block, then I can go ahead and cross the street quickly.

2—Where is the proper place for you or anyone to cross the street?

At a crossing; and I should never cross a street at any other point for the reason that there is less danger at crossings than at any other point.

3—What precautions should you observe in crossing a railroad?

Look both ways—cross with the watchman's signal, but never when the gates are down. Stop! Look! Listen!

4—Why should you not play in a street frequently used by automobiles or other vehicles?

Because I am apt to bewilder the drivers, thus making them lose control of their vehicles, which would be dangerous not only to me, but also to others.

5—What would you do if you were standing in the middle of the street and should see automobiles or other vehicles coming both ways?

I should stand perfectly still and let the vehicles pass around me, because they are not likely to run over me if I do not move.

6—What danger is there in stealing a ride on an automobile or other vehicle?

I am in danger of falling off and being injured, or I may be run over by another vehicle when I jump off. This is a very dangerous practice and I should avoid it.

7—In case a child or anyone is injured by an automobile, what is the first thing to do?

I should secure assistance, notify the child's parents and stand ready to assist in getting the injured one to the nearest hospital as quickly as possible.

8—Should you ever throw stones at an automobile or other vehicle and why?

I should never throw a stone or other missile at any vehicle because I might hurt someone, or damage the vehicle, or cause the driver to lose control, which might result in an accident, and for the reason that it is against the law.

9—Should you look after younger children in crossing the streets, and why?

I should assist younger children in crossing the street because they cannot think as quickly as I can and may not realize the danger which threatens them.

10—What should you not do if you see an automobile or other vehicle unattended standing on the street?

I should not touch it or move any of the levers, or blow the horn, or even go near it. I might release a brake or start the engine or do something else that would do damage and the reason that it is against the law.

11—When playing on a street and you see an automobile or other vehicle approaching, what should you do?

I should step to the side of the street or to the pavement until the vehicle has passed.

12—Should you stand on the sidewalk close to the street when vehicles are passing close to the curb, or should you ever stand close to any vehicle when it is passing you?

No, because it is very dangerous. I should get as far away as possible from any passing vehicle.

13—Should you ever use roller skates, coasters, or other similar contrivances on the street?

Never, because they are always dangerous, particularly on the streets frequented by automobiles and other vehicles.

14—What should you do upon alighting from a street car?

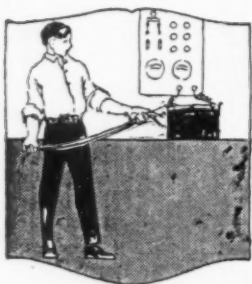
Beat it for the nearest curb instead of cutting behind the street car.

Montreal, Ont., Can., June 7—The address of the president of the Canadian Automobile Association at the fifth annual meeting held at Hamilton in conjunction with the fifth Good Roads Congress shows the valuable work which motor organizations throughout the country are doing. L. B. Howland, who was re-elected as president for the ensuing year, mentioned that the number of motor cars in Canada had increased since last the association met by

CANADIAN CLUBS ACTIVE
100 per cent in all, and with over 200,000 cars in operation Canada to-day ranks third among all the countries in the world as regards the number of motor vehicles owned and operated. Purchases of cars by western farmers is largely responsible for the increase.

Reports that restrictions were to be placed on the use of gasoline by motorists made it seem advisable to the executive

to obtain first-hand information from the authorities at Ottawa as to the exact situation. When interviewed, the Fuel Controller stated that his department did not at present have jurisdiction over gasoline; that it could have this jurisdiction if it were deemed advisable, but at present there was no intention of asking for it. There did not seem to be any necessity for interfering in any way with the importation or sale of gasoline.



Electrical Equipment of the Motor Car

By David Penn Moreton & Darwin S. Hatch.



Editor's Note—Herewith is presented the ninety-eighth installment of a weekly series of articles begun in MOTOR AGE, issue of June 29, 1916, designed to give the motorist the knowledge necessary to enable him to care for and repair any and all of the electrical features of his car, no matter what make or model it may be. At the conclusion of this series, "Electrical Equipment of the Motor Car," with additions, will be published in book form by the U. P. C. Book Co., Inc., New York.

A thorough explanation of the fundamentals of electric circuits preceded descriptions of the general types of starting, lighting and ignition apparatus, signalling devices, magnetic transmissions, etc. This is being followed by the installation, care and repair of individual systems, beginning with the special equipment for Fords.

Part XCVIII—Splitdorf System for Ford Cars

THE Splitdorf electrical system for the Ford is a single-unit, two-wire type in which the generator output is controlled by a special field winding. The battery consists of six cells arranged in two groups of three cells each. These two groups of cells are connected in series by a special starting switch when the starting motor is in operation and in parallel when the starting switch is in its normal position, that is, the starter operates on 12 volts and the lamp on 6 volts.

Preparation of Engine

Remove the radiator and all the water connections from their clamp couplings at the engine. Remove the fan and its mounting, and turn the engine over by hand until the pin holding the fan pulley is perpendicular, and then drive the pin out through the hole in the engine base. Drive out the pin holding the ratchet clutch on the end of the starting crank and pull out the crank.

Remove the bolts marked B and C in Fig. 547, but before removing the nut A entirely from the bolt tie a piece of twine around the threads below the nut to prevent the bolt from dropping in the motor base or the crankcase. If the bolt should happen to drop it will remain in the hole and a sharp blow on the crankcase directly under the bolt will cause it to jump upward and be caught with the fingers.

Mounting Crankshaft Sprocket

Place the adjustable bracket in position and secure it to the engine, using the bolts supplied at B and C and the nuts formerly

on the old bolts. The bolts holding the lower part of the bracket should be tightened, as it is important that this part be held tight to the engine.

Now place the split taper sleeve A, Fig. 548, on the engine shaft and drive the pin B through the holes in the sleeve and shaft, which should be in alignment with each other, until it is flush with the sleeve on both sides. With the key in position in the sleeve drive the sprocket C on the sleeve, the keyway registering with the key. The nut D now should be turned on the end of the sleeve. This causes the sprocket to become well seated on the taper portion of the sleeve and at the same time causes the split end of the sleeve to grip the engine crankshaft.

Replace the starting crank, start the chain under the sprocket and with the starting crank turn the engine over slowly until the chain is drawn through for about half of its length, making sure that the chain is working freely.

Mounting the Electrical Unit

Fasten the electrical unit to the adjustable bracket with the three bolts and lock washers furnished. This operation can be accomplished very easily by tilting the bracket. Place the chain in position over the sprocket on the end of the shaft of the electrical unit, join the ends of the chain with the pin and lock the pin with a washer and cotter pin. Align the crankshaft and generator motor sprocket by the adjustable bracket hinge bolt. Adjust the chain to its proper tension, that is, without any undue amount of slack.

The aluminum fan pulley is made in two parts and clamps over

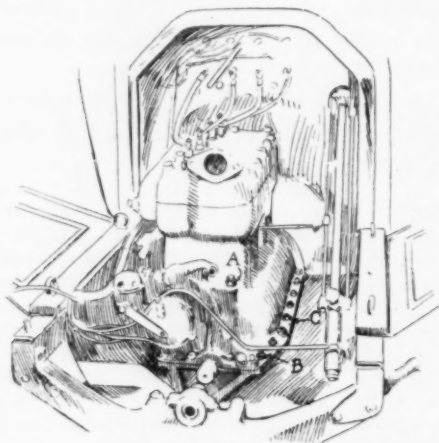


Fig. 547—Bolts that must be removed to install the Splitdorf mounting bracket

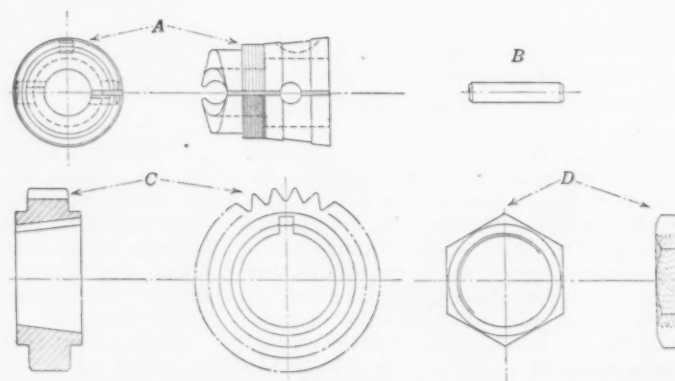


Fig. 548—Driving sprocket and taper sleeve upon which it is mounted

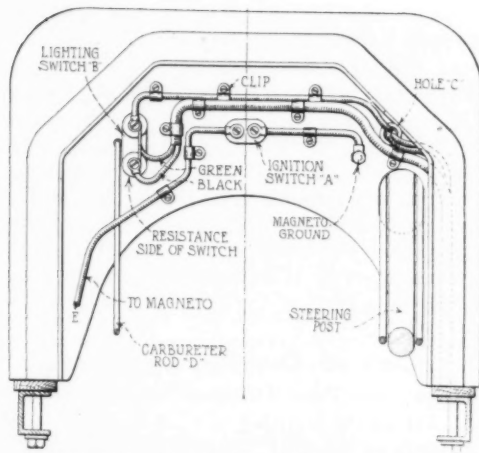


Fig. 549—Method of installing wiring on front of dash for Splitdorf system

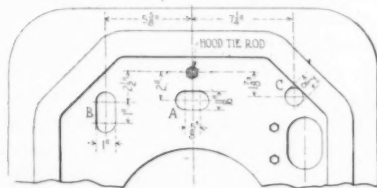


Fig. 550—Location of holes that must be drilled in dash for Splitdorf system

the Ford fan pulley. The new pulley is held in position by four screws and lock washers. Fill the recess of the fan with grease and replace the fan, using the original bearing stud, and place the fan belt in position and adjust it to the proper tension.

Installing the Wiring

Prepare the dash of the car for the wiring by cutting the holes shown in Figs. 549 and 550. Hole A in Fig. 550 is for the ignition switch. Hole B is for the lighting and dimming switch and hole C for wires leading to the indicating automatic switch. The hole A may be omitted unless a magneto is to be used for ignition.

Bore a $\frac{7}{8}$ -inch hole in the permanent floor board, shown in Fig. 551, following the dimensions given for its location. Install the starting switch with the front of the switch lengthwise with and facing the front right-hand side of the car. At the same time the lighting and dimming switch should be placed in position, with the coil end of the switch facing down.

All the wire terminals are marked to correspond with similar marks on all parts of the installation. Lay the wiring assembly in the frame of the car, connecting the wires to the front of the

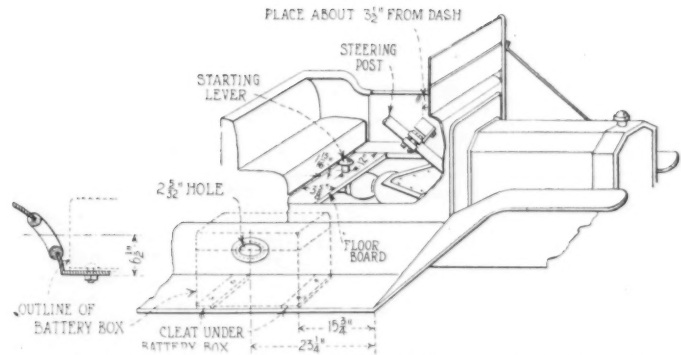


Fig. 551—Directions for locating different parts of Splitdorf system

dash, as shown in Fig. 549. Reference to Fig. 552, will assist the installation. Connect the wires to the indicating automatic switch in accordance with the diagram on the back of the switch, after which fasten the switch to the steering column about $3\frac{1}{2}$ inches from the dash. Connect the wires, as marked, to corresponding terminals on the electrical unit and also to the starting switch.

Holes should be drilled in the cross braces of the frame in front to accommodate the headlight wires. Place the wires in position and secure them with clips, using a conduit to protect the leads where they pass under the starting crank. These clips and conduit are supplied with the equipment, and the method of mounting them is shown in Fig. 552.

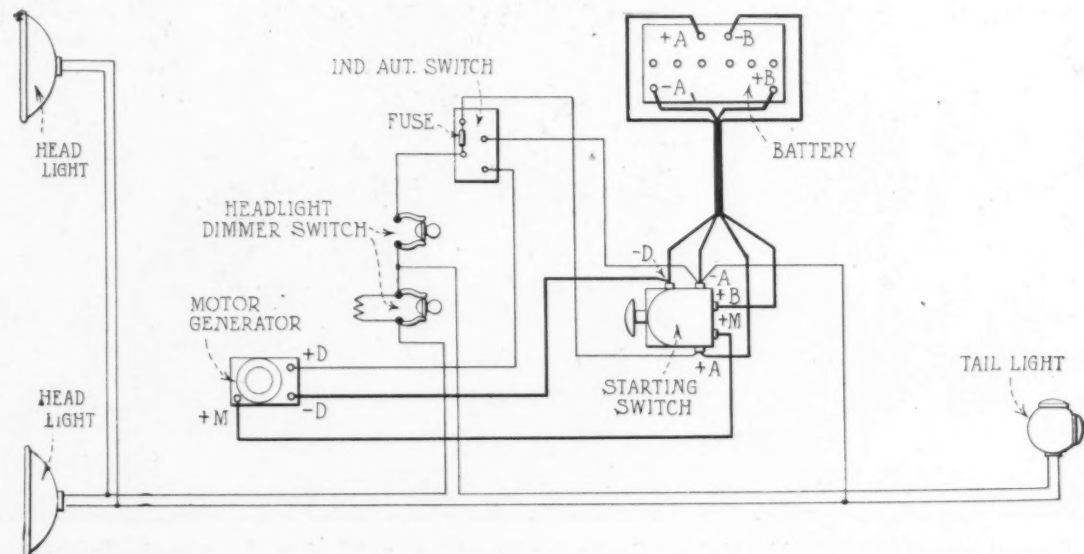
Installing Storage Battery

Prepare the curved running board guard, or splash apron, for the battery leads and the running board for securing the battery box, as shown in Fig. 551 and fasten it securely in place with bolts, nuts and lock washers, all furnished with the outfit. Place the battery in the box with the outside, end terminals, toward the car. Pass the extension cables under the wood sill and over the channel steel frame of the car, connecting the extension leads from the battery to the starting switch as marked and to corresponding terminals on starting switch and battery. The method of installing the battery cables is shown in Fig. 553.

Indicating Automatic Switch

The indicating automatic switch is connected in the circuit between the generator and the storage battery. Its primary function is to close the circuit between the generator and storage battery when the voltage of the generator exceeds the voltage of the battery, and it also serves to break or open this circuit when the voltage of the battery exceeds the voltage of the gen-

Fig. 552—Complete wiring diagram of the Splitdorf electrical system for Fords



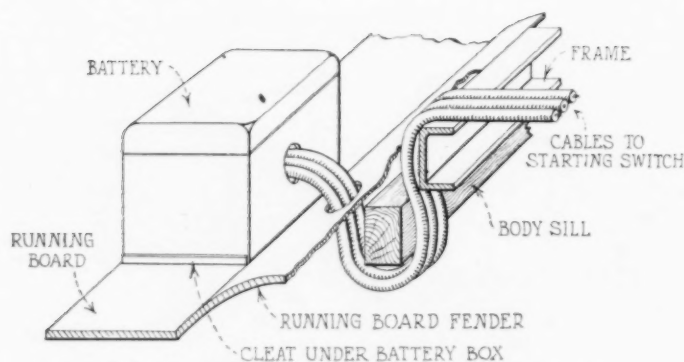


Fig. 553—Method of installing battery cables

erator. The switch is equipped with an indicating dial which shows whether or not the battery is being charged.

Special Starting Switch

The starting switch performs the additional function of connecting the two sections of the storage battery in series when the starting motor is being operated. When the starting switch is depressed the two 6-volt units of the battery are connected in series by certain connections in the switch and a 12-volt current is supplied to the electrical unit, which now is operating as a motor. This change in battery connection, however, does not affect the voltage applied to the lamps, as they are connected to one or the other of the 6-volt sections all the time. When the starting switch is in its normal position the two 6-volt sections of the battery are connected in parallel and charged as any 6-volt battery would be charged.

Path of Current

The generator and starting motor circuits may be traced by reference to the wiring diagram given in Fig. 552. Starting with the terminal marked D + on the generator pass along the small wire to the terminal on the indicating automatic switch marked D +, through the heavy winding in the automatic switch and out to the terminal marked B +, then to the terminal A + on the starting switch, where the current divides, one branch going to the A + on the battery and through the battery to A — on the starting switch and the other branch going to the jumper in the switch to B + on the starting switch, then to B + on the battery through the battery to B — on the starting switch. The point

B — D — on the starting switch is common to the negative terminal of both sections of the battery and is connected to the negative terminal of the generator marked D —.

When the starting switch is depressed the circuit may be traced from the battery terminal A + to A + on the starting switch, through the starting switch to the terminal M +, then to the terminal M + on the electrical unit, through the winding of the electrical unit to the terminal marked B — D — on the starting switch, then to B — on one section of the battery, through this section of the battery to B + on the battery, then to B + on the starting switch, through the switch to A — on the switch, to A — on the battery, through the battery to A + which completes the circuit.

Care of Electrical Equipment

The electrical unit should be oiled at least every 1,000 miles by inserting five or six drops of medium high grade oil in the oil holes at the ends of the unit. Watch the alignment of the electrical unit so that the chain runs perfectly true, and keep the chain reasonably tight.

Keep the commutator clean, wiping it off with a cloth. If it becomes blackened or roughened it may be cleaned and smoothed up with a piece of 00 sandpaper. Never use emery paper. Carefully clean all dust and particles of sand from the commutator and from between the segments after using the sandpaper.

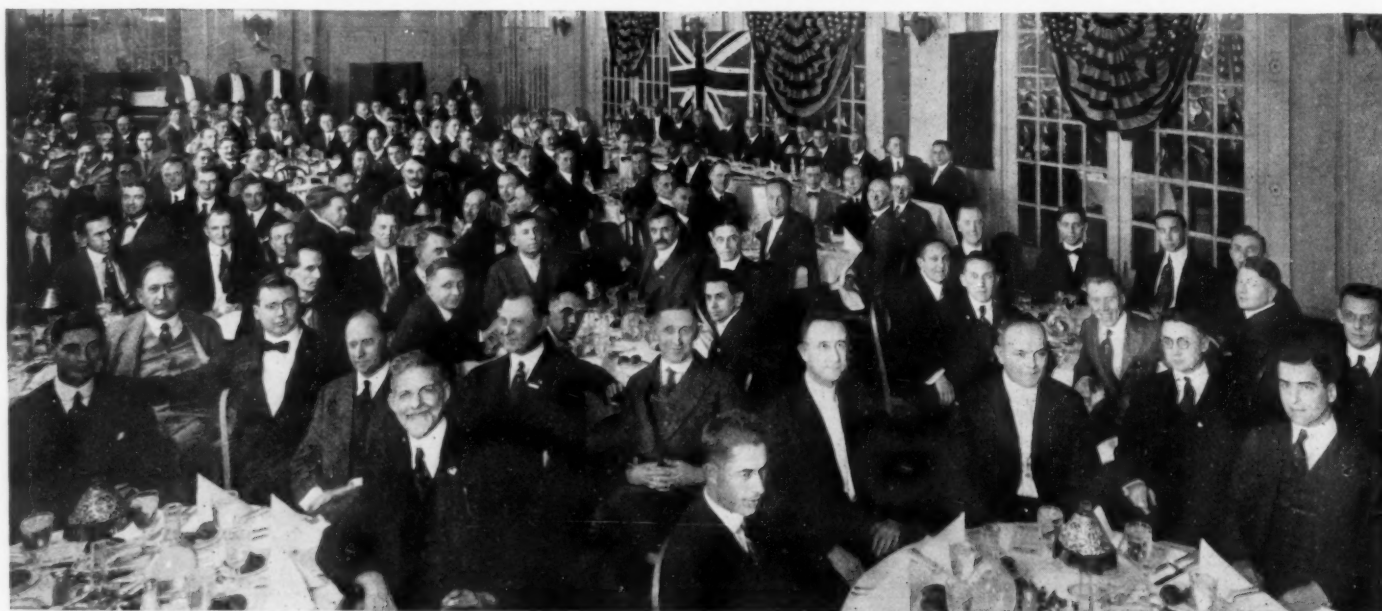
Do not change the position of the brushes and do not alter the tension of the brush holder. See that the brushes make good electrical contact with the commutator surface, that they are not unduly worn and that the brush leads do not rub against the armature.

If the electrical contacts in the starting switch wear abnormally, see that the foot pedal of the switch is not stuck in the floor board. The hole in the floor board should be large enough to prevent the pedal spring from rubbing against the floor board. See that proper contact is made when the starting switch returns to its normal position. The contacts and various electrical connections can be examined by removing the cover of the starting switch.

If the battery is removed from the car or disconnected for any reason, the electrical unit must be protected by connecting a wire across the posts D + and D —.

To prevent an excessive drain on the battery and to increase the ease of starting in cold weather, it is imperative to lead the carburetor choke rod to the dash, where it will be readily accessible at all times.

Gas Engine and Automotive Men in Meeting



Eleventh annual dinner held by National Gas Engine Association and Society of Automotive Engineers in Chicago June 4

An "Honest to Man" Tractor Demonstration

Maker Thinks Tests Should Include Making Seed Bed, Belt Work, Light and Heavy Hauling

THE fundamental principle of the American Government is service to mankind. The day has dawned, the era has arrived when that principle must permeate and actuate all the manufacturing industries of our country. It may seem like a long step from Governmental principles to building tractors and tractor demonstrations, but an analysis of the proposition reveals that they are closely allied.

In no industry is there a greater need of the guiding principle of service to mankind than in the tractor industry, and further there is no industry in which such a guiding principle will be more productive of permanent and far-reaching economical and National benefits.

The great war has shown clearly that "that nation only is secure and absolutely defensible which produces a surplus of the essentials of existence." The primary essentials of existence are the agricultural products, and, first of all, the tractor is an agricultural implement.

All Motive Power

In the tractor industry, that manufacturer serves mankind most, who builds a tractor which will supply to the farm all the needed motive power for all classes of work both in traction and at the belt, which will enable the farmer and his help to do the same quality of work with the tractor as with horses, which will do far more of this quality of work in a given time with a far less cost of upkeep and operating expense and which will do this quality work for a satisfactory term of years.

That is, a tractor demonstration will be "real" which will demonstrate to the farmer that the tractor will do the things outlined above.

Heretofore, tractor demonstrations have been conducted to show that a tuned-up tractor operated by an expert tractor operator will "run" and that tractors with plow experts tagging along behind will "plow." The balance of what a tractor would do on the farm and with farm work has been left to the farmer's imagination or else materialized for him by the tractor salesman.

Again, tractor demonstrations have been advertising campaigns in favor of certain types of tractors and certain manufacturers who did not care to show the full extent of the tractor's usefulness, for if this were done it might hurt the sales in other lines of implements built by these manufacturers. It did not take a very close observer to note these facts at the Fremont demonstration of 1917. At Fremont it rained on Monday night and immediately the order went forth, "No plowing on Tuesday." WHY? The soil was in no worse condition than many places somewhere in the field that the farmer must plow through.

Demonstrations of the belt work of tractors would compel the standardization of the sizes of belt pulleys, belt speeds and belt drives not only on tractors but on the

Editor's Note.—The following article is written by a tractor manufacturer who at the same time is a practical farmer. He knows what a tractor ought to do for the farmer, what the farmer expects a tractor will do and how nearly these requirements can be worked out in design and mechanical construction. His contention is that every tractor which asks the patronage of the farmer first should prove its worth competitively. The writer thinks this might be partially accomplished if tractor demonstrations were "Honest to man tractor demonstrations." This is an argument that such be held. For certain business reasons the author of the article prefers that his identity be concealed for the present.

machines to be driven. It would eradicate the "hit or miss" method of locating the belt pulley.

One authority on agricultural machinery has correctly stated, "A tractor must be a perfect belt machine." For the tractor to be a perfect belt machine, the pulley must be correctly located, must be of the right size, the belt speed must be absolutely governed, and the aligning of the tractor, the tightening of the belt, the starting and stopping of the pulley must be under the control of the driver from the driver's seat, if economy in time and perfect results in the machine driven are to be obtained.

When the farmer sees a belt pulley improperly located, he at once realizes that the men who designed that tractor had no practical farm experience. That is the very trouble with most tractors to-day. They are designed by men who perhaps have a good knowledge of mechanical laws, but they have never had those laws interpreted by Old Mother Nature out on the farm.

Show Hauling Ability

To demonstrate the hauling ability of the tractor, show the farmer how he can take a certain amount of weight to market and how quickly the high speed will bring him home.

Accessibility of parts, and how quickly repairs can be made out on the field with the tools that the farmer has, is another vital point with the farmer when considering the tractor. Let such a demonstration be given. Have the committee break a certain part on all tractors and at a given time, let the men go to it and see what luck they have. This might spoil a few sales, cause a few engineers to lose their jobs and open the manufacturer's eyes, but it would be a blessing to the farmers and a Godsend to the tractor industry.

"Quality" tractors will be the result, the farmer's scepticism will be turned to enthusiasm, his lethargy to buying, our agricultural products will be multiplied, the cost of living decreased and our National existence secured.

Investigation reveals that from 30 to 60 per cent of the tractor's work on the farm

is belt work. Why were we not shown what the tractor would do for the farmer when hitched up to this class of work? Was it to keep the farmer from knowing that the medium-sized properly-equipped tractor would do his belt work so that he would keep on buying the big costly gas monstrosities of by-gone ages, or was it to keep from revealing the unpracticalness of the belt drive of 80 per cent of the tractors shown? Who knows the answer?

The tractor's ability to handle belt work, ease of alignment with the machine to be driven, the amount of power continuously developed, the facilities of control and the economy of operation are vital questions to the farmer and every prospective purchaser.

Work Under Difficulties

The time has come to show what the tractor will do on the farm under adverse conditions, not that the farmer should or would want to work his soil when not in the proper condition but that he may know that if it is necessary, he can, and further, that if his tractor does get in a bad place, it will be able on its own power to extricate itself and not wait on spade, jack-screws, planks and horses.

A horse that will work in ideal conditions only is not a valuable horse on the farm. A balky tractor is of far less use than a balky horse. Demonstrations should be used to weed out the balky and impractical tractors.

The classes of work shown at the tractor demonstrations should be selected by a non-interested committee composed of practical farmers. This would mean that the farmer would be shown that the tractor would do his work. It would be of untold value to the farmer in selecting a tractor for his class of work. It would mean that all demonstrations would be of a practical nature. It would mean that the demonstrations would be taken out of the hands of those that had some one or two features to show up or more to conceal.

These demonstrations should be composed of three classes of work, namely, making the seed bed, that is, plowing and fitting; belt work; and both light and heavy hauling. In the making of the seed bed, the first consideration should be the quality. The practical farmer desires to know if he or his help can with the tractor make as good a seed bed as they can with their horses. Then should be considered time taken and cost of operation, including fuel, oil, etc. Belt demonstrations should show that the tractor will develop a continuous necessary power to operate a medium-size ensilage cutter or grain separator. It also should show the ease and dispatch of aligning with machine to be driven, also the control and cost of operating. This would reveal the impractical belt drives, belt speeds and belt pulley location found on so many tractors claiming to be complete farm power units.

The Readers' Clearing House

Conducted by B. M. Ikert

The Electrical System

Using Magneto for Ignition

Q.—I have a four-cylinder Saxon roadster equipped with storage battery and Atwater Kent ignition system. I am using a K-W alternating current magneto generator for lights, capable of lighting two 20-cp., 3-amp. bulbs at speed of from 2000 to 3000 r.p.m. Could I use this same magneto in connection with this coil for ignition? Have tried it, but engine misses at intervals. Could the engine be started on this magneto?—John Rudert, Ft. Thomas, Ky.

The makers of the Atwater Kent system do not advise the use of anything but dry cells or storage battery for their ignition system. The latter is not intended for alternating current, and this is one reason, no doubt why your engine misses when coupled up to the low-tension magneto. Another reason is that the magneto does not generate sufficient current for the coil. You may overcome the missing temporarily by adjusting the points of the distributor a little closer. The engine cannot be started on the magneto you have, because it is a low-tension outfit and necessitates a coil to step up the current to a high-tension.

Unusual Switch Trouble

Q.—In regard to the actions and causes of a Connecticut switch, we have and have had before the ignition switch, which is of the automatic throw-out kind, buzz and throw-out on the road to such an extent that they could not be used. We naturally looked for a short or some wrong connection either in the switch or other parts of the system but could not find anything that looked as if it were wrong. We found by taking a pair of pliers and bending the part that is warped to a contact by heat farther away from the connection that our troubles were over, but we could not understand why this would occur on a switch that had been working well for so long a time.—E. J. Pace, Bentonville, Ark.

Your trouble probably is caused by one of two things, a short-circuit resulting from defective wiring, which causes a very heavy current to rush through the switch circuit. While the switch would kick out, the overheating would tend to put a permanent set in the thermostat element.

Then again, should the battery become disconnected, even momentarily from the generator circuit while the car is running, the ignition circuit would receive the full surge from the generator and this condi-

tion would act very much like a short-circuit, although it would not have the disastrous effect of the first instance. Another cause of failure is often due to tampering with the factory adjustment. It is likely that the failure of your switch can be traced to one of these causes, as failure to operate seldom is traced to inherent defects. You have applied the proper remedy to correct the trouble, but in the long run it would be better to have a service station look the thing over for you.

Has a Short-Circuit

Q.—I am having trouble with a 1915 Hudson, model 54. At times when driving at any speed the power is gone from the engine, leaving it dead. I have had this happen as often as fif-

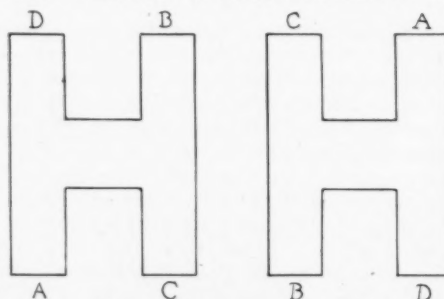


Fig. 1—Conventional layout of reverse, high, second and first speed positions of gearset lever

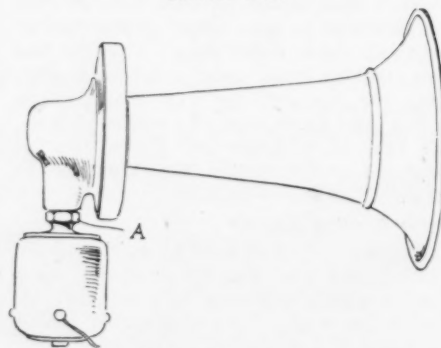


Fig. 2—Side view of Klaxon horn, showing where adjustment for tone is made

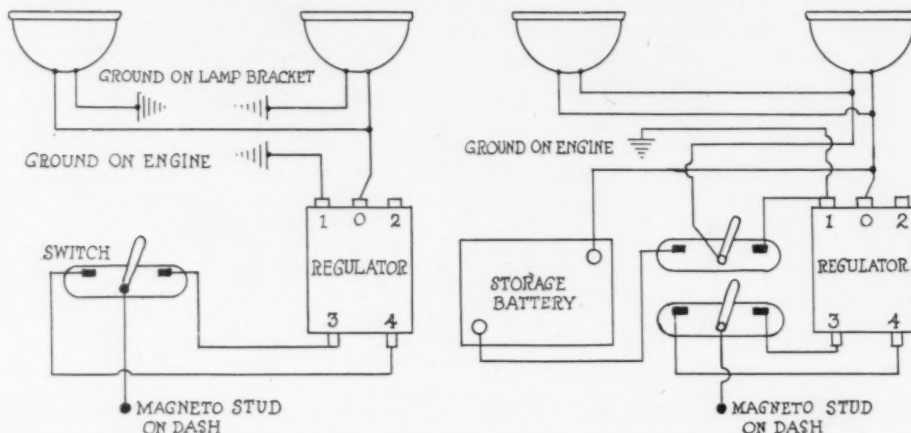


Fig. 3—Wiring diagram of Jefferson regulator for Fords, showing two ways of installing

teen times or more on 5 miles of driving on pavements, and again it may not happen in a drive of 50 miles. When this occurs, I find I can not start on the magneto, but if I start on the battery and then switch to the magneto it is all right, until it occurs again. Also, I have noticed that when this happens in night driving, the lights all go out, but, starting the car as stated, lights are all right again. Have had the car examined for this trouble by a Hudson service station. They took out the magneto points and looked them over well, also examined the storage battery and dry cells, had the carburetor off and looked everything over, but could not locate anything. They tried the wires and found no loose ones, but I still have the trouble and I believe there must be a short at some point.—F. A. Schleuder, Austin, Minn.

You no doubt have a spasmodic ground which should be looked for in the following places in the order named: The leads running from the storage battery to the motor generator or the lead running from the rear terminal on the generator to the combination switch, the storage battery itself, its connection to the frame of the car.

The ground may be in the battery itself and may be caused by buckled plates or an accumulation of sediment. The former trouble is usually the result of charging or discharging the battery at too high a rate, and the latter is due to neglect to clean the sediment out before the chamber provided for its collection becomes filled. This would be termed an internal short.

Starter Makes Grating Noise

Q.—What would cause the starting apparatus on model 35 1913 Oakland to make such a grating noise either with starting switch or crank?

2.—Has this model gear or chain starting device? Also what style clutch has it got?

3.—The engine is hard to start and knocks and stutters climbing an incline. Would carbon cause this condition?

4.—This car is equipped with Deaco electric appliances. Is this firm still in existence?

5.—While idling along at 5 or 10 m.p.h. the lamps flicker. What does this denote?

6.—My storage battery, a Monarch, seems to discharge very quickly. I use the car mostly at night.—A. MacAndrew, Battle Creek, Mich.

1.—Loose bearings in the starting motor; also high mica in the starting motor armature.

2.—Gear, drive and cone clutch.

3.—Yes, but evidently your valves need grinding in addition to the removal of the carbon deposit.

4.—Yes.

5.—There is either a short-circuit in the electrical system or that the generator is not supplying the proper amount of current.

6.—Check up on the charging rate of the generator and the specific gravity of the battery. Also be sure that the plates in battery are covered with the solution.

May Be Wrong Gap

Q.—I have a 1915 Maxwell, model 25. It has been run about 4000 miles. It is in good condition and has been well kept. It has a new storage battery, which is all right. I only used it once a short distance and could not get any spark. I then sent the magneto to the factory, had it overhauled, had a Simms high-tension coupled on. Started it and it seemed all right, but after stopping it, it was very hard to start. It got very warm soon. So I stopped it and could not start it any more. I had a new set of dry batteries. They were burned up. I bought a new set of dry cells, and when they were connected, upon attaching the wire from the mag-

neto to cells, sparks began to appear. It soon got warm. The dry cells would have soon burned up, but I have the wiring diagram of this car and traced all the wires and found everything connected as instructed. As soon as the wire from the magneto touches the dry cell, sparks and heat appear. Would the transformer coil have anything to do with it in case it was wrong?—J. S. Fislar, Omaha, Ill.

The nature of your trouble leads us to believe that somewhere in your wiring you have a direct short. Check up on the switch and on the transformer coil. It may be possible that your starting trouble lies in the adjustment of the breaker points in the magneto, either being too close or too far apart. The proper and best working distance is 10 mm. If you do not have a gage, the thickness of a Gillette safety razor blade or calling card will closely measure the distance.

Connecting Jefferson Regulator

Q.—I have a magneto lamp regulator for my Ford car and am unable to connect it to make it work. It has three connections on the top and two on the bottom, making five in all. It was manufactured by the Jefferson Electric Mfg. Co., Chicago. Explain it.—H. E. Nathan, Akaska, S. D.

Two methods for wiring up the Jefferson regulator for Ford lights are shown in Fig. 3. At A is shown the method when using the regular installation, while B shows the wiring with storage battery also.

At A the regulator is used for headlights only. Binding post No. 1 is grounded. Post 0 is connected to one side of each light, and the other side of the lights is grounded to the lamp brackets. Posts No. 3 and 4 connect to right and left-hand binding posts on the double-throw switch. The center binding post of the switch connects with magneto, using the stud on the inside of the dash. By throwing the blade of the switch to the left the lights are dimmed for city driving, and by throwing to right full candlepower of the lamps is realized.

At B, where a storage battery is used, an extra double-throw switch is necessary, and the lighting circuit is not grounded. One terminal of the battery connects to the same side of the lamps as binding post 0, and the other battery terminal connects to the left side of the extra double-throw switch. One side of the lamps connects to center post of the switch and the other side of the switch connects to binding post 1 of the regulator. The other connections are the same as in A.

On 1914 and earlier models the connections are identical with these, except that binding post No. 2 is used for one side of the lamps in place of 0.

Battery Not Charging

Q.—I have a 1915 Oldsmobile, model 42. Last winter I let my battery freeze and had to buy a new one. I had a certain make of battery installed at the local service station. About once a month it goes down. The first time it went down I had the generator cleaned, a set of new brushes installed and an ammeter put on. In about a month, the battery went down again and not long ago it was necessary to have it again charged. At present I have an Exide in the car; it has been in for about three weeks and is still working fine. This battery cranks the engine faster than mine ever did. Could it be possible that the electrolyte is weak in mine? As I understand it these batteries are shipped dry and the electrolyte is added at the service station. What is the composition of electrolyte?—F. K. Irving, Des Moines, Iowa.

It would seem that the greater part of your trouble lies in your generator not delivering its charge to the battery at a high enough rate, or that you do not do enough

TO assist readers in obtaining as a unit all information contained in this department on a certain subject in which they may be most interested, such as Ignition, carburetion, etc., MOTOR AGE has segregated inquiries into classes of allied nature. Questions pertaining to engines will be answered under that head, and so on.

THE ELECTRIC SYSTEM

John Budert.....Port Thomas, Ky.
E. J. Pace.....Bentonville, Ark.
F. A. Schleuder.....Austin, Minn.
A. MacAndrew.....Battle Creek, Mich.
H. E. Nathan.....Alaska, S. D.
F. K. Irving.....Des Moines, Iowa

MISCELLANEOUS

J. F. Brown.....Omaha, Neb.
H. S. Herbrecht.....Grinnell, Iowa
F. W. Collins.....Montrose, Col.
W. L. Skinner.....Miller, Ala.
Brent T. Harding.....Dunlap, Cal.

ENGINES

E. S. Marti.....Havana, Cuba
D. R. Petrie.....Harlowtown, Mont.
H. B. Mahan.....Williamsburg, Ky.
C. W. Hartu, Jr.....Hobart, Okla.
E. B. Monmonier.....Pearce, Ariz.

REBUILDING

George L. Jacobs.....Marengo, Iowa

No communication without the writer's name and address will be answered in these columns.

running to give the generator an opportunity to properly charge the battery. This would be more noticeable if you stopped and started frequently.

Electrolyte, or the fluid placed in the battery, is dilute sulphuric acid. Its specific gravity or strength depends on the amount of charge.

Miscellaneous

Gear Lever Position

Q.—Publish definite rule for finding the different gearshifts through a ball and socket shifting device that is not marked. Show the different positions in a standard type selective gearset, while sitting at the wheel.

2—How can I tell when the switch is on with most of the newer type rotary switch that turns with a key and is not marked?—J. F. Brown, Omaha, Neb.

1—Consider the ball and socket to repre-

sent a figure H, Fig. 1. A would be first speed; B, second; and C, third, or direct, while D would be reverse. In the majority of gearsets, direct is opposite first and second is on the diagonal from first. Reverse is on the diagonal from direct.

2—Generally you can only insert the key when the switch is off. That being the case one turn of the key after insertion ought to bring the switch to the on position.

Adjusting Klaxon Horn

Q.—Is there any way to adjust a Klaxon horn so as to change the tone? It is the largest electric Klaxon.—H. S. Herbrecht, Grinnell, Iowa.

To adjust the Klaxon horn loosen the locknut A, start the current by pressing the push button and, while it is sounding, twist the motor case until no sound is heard except the buzzing of the motor. Continue twisting in either direction until the note is clear and loud. When you get the desired note, simply tighten the locknut.

Tempering Chisels

Q.—How may I temper chisels and punches after drawing them out and what is the best heat to draw them out with?—F. W. Collins, Montrose, Col.

The tempering of steel is an art in itself and requires quite a bit of practice. However, with due regard to details, you ought to have success. To 1 gal. of common fish oil or whale oil add 1 lb. each of beeswax and resin. When this has been thoroughly mixed by boiling and stirring heat the steel until the scale rises a little, then immerse in the boiling oil. When cool, heat over a clean fire until the steel becomes a cherry red and immerse in cool oil. For certain purposes the proper color to heat to for chisels is yellow, tinged with purple to light purple.

Wants to Exchange Parts

Q.—I have a 1916 Buick six-cylinder, model 45, and I want to know where I can exchange the starter and generator, battery and coil, and

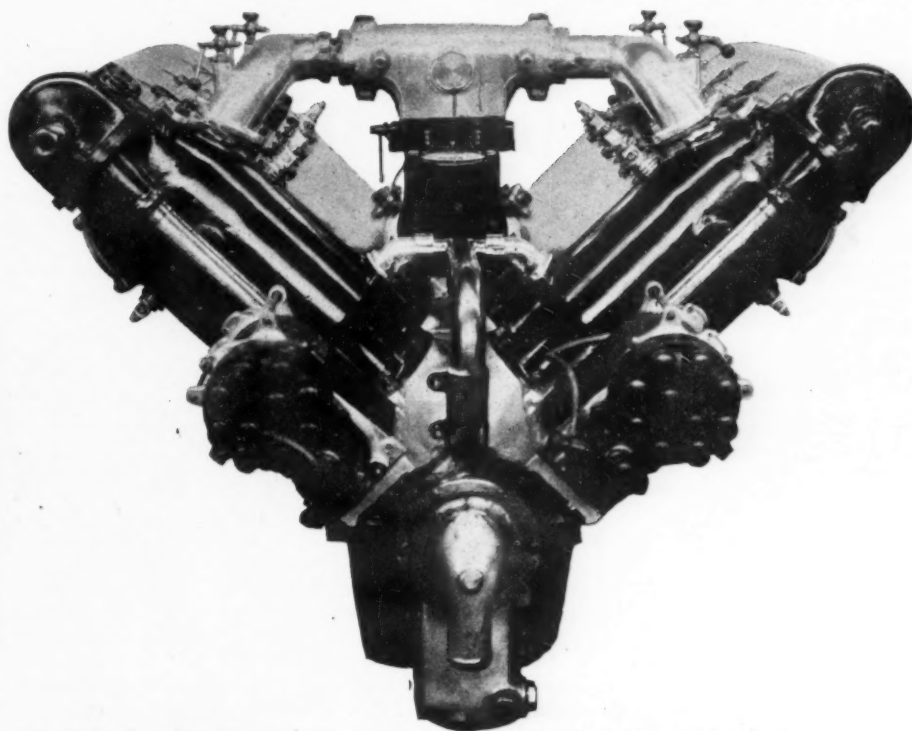


Fig. 4—End view of Hispano-Suiza aviation engine. Each cylinder block uses eight plugs

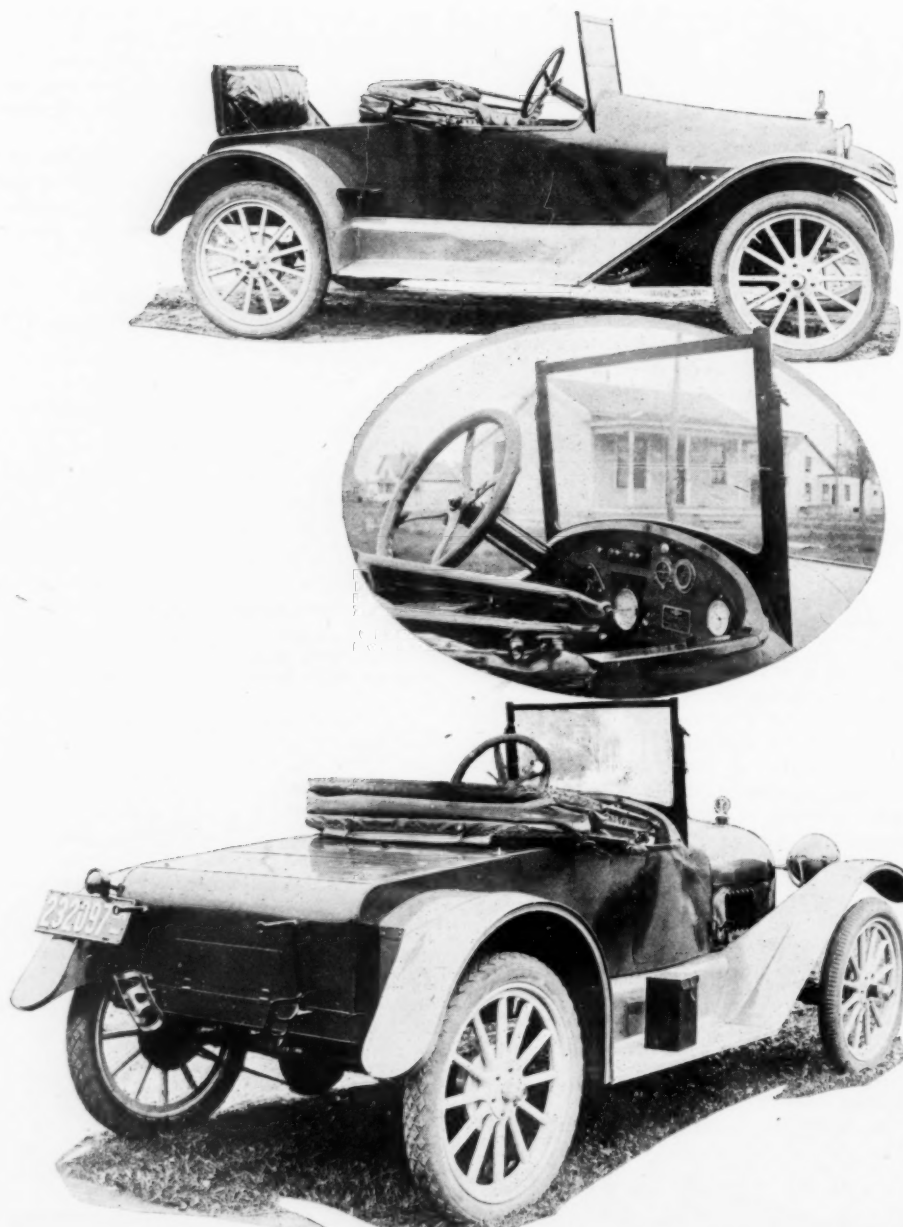


Fig. 5—Chevrolet car rebuilt by reader into a four-passenger model, with auxiliary seat under the rear deck. The instrument board is made of quarter-sawn oak, with ammeter, clock, etc., neatly placed. The body is a smoke color, fenders gray and the wheels white

distributor outfit for a generator that can be used without a battery and a high-tension magneto. Where can I get couplings and fittings?—W. L. Skinner, Miller, Ala.

You no doubt will be able to obtain the desired material from any of the firms advertising in the Clearing House, published in *MOTOR AGE*. A list has been sent you by letter.

Hispano-Suiza Engine

Q.—I read in *MOTOR AGE* that the Wright-Martin Aircraft Corp. will use the 300-hp. Hispano-Suiza aviation engines. I know only of the 150 and 200 hp. eight-cylinder engine. Give details, number of cylinders and size of the same of the new 300-hp. type. Has this engine the propeller geared down, or mounted directly to the crankshaft? Publish a photograph of this new engine.—E. S. Marti, Havana, Cuba.

In Fig. 4 is shown an illustration of the Hispano-Suiza aircraft engine. There are eight cylinders, set at an angle of 90 deg. Each cylinder block carries two sets of plugs and as shown two magnetos are carried at the front end. The valves are actuated from an overhead camshaft on each

block and the carburetor is hung centrally. *MOTOR AGE* has not the bore and the stroke measurements of this particular engine. The propeller on this model is mounted directly on the crankshaft.

Reader Submits Plug Design

Q.—What is your opinion as to the advantage of a spark plug as per attached drawing, or is there any, other than the fact that a car owner can see that each plug is firing properly? Does the brake, indicated by arrow, make a spark faster, slower or hotter?

2.—What is meant by a static and voltaic potential?—D. R. Petrie, Harlowton, Mont.

1.—Aside from adding to the complications of constructing the plug, it is doubtful whether you would get anything worth while out of this construction. Tests by one of the leading magneto makers in this country seem to show that the introduction of a spark gap like this raises the voltage but the extra resistance thus introduced compensates for the advantage gained. For example, you may double the voltage by doubling the resistance, but as the former has to meet the doubled resistance you can

readily see that the net current flow is the same as before.

It is also said by some authorities that the introduction of such a gap causes delay in the production of current in the primary circuit when the circuit is broken at the points, with the result that increased arcing results, causing the breaker points to burn away more readily.

2.—Static electricity is that produced by rubbing two unlike surfaces together, such as silk and glass, or by induction. Voltaic electricity is produced by the chemical decomposition in a battery or by moving a conductor across the lines of force of a magnetic field, as a dynamo.

Pistons Pump Oil

Q.—I have a Chalmers 6-30, 1916 model. This car has one of the 3400-r.p.m. engines and has aluminum pistons. I have driven it just a little over 3000 miles and never have had any trouble with oil coming through on my plugs until the last 400 or 500 miles, and now I am having some trouble with No. 1 and No. 6 cylinders.

I have heard a great many complaints about this car along this line and I cannot find out the trouble. I have handled this car all the time myself and have taken the best of care of it. I always keep my oil close to three-quarters full and use heavy oil. I do not know anything else to do. Have you anything that will help me?

2.—Could I get a set of light steel pistons for my car without having any excess bearing trouble? If so do you know of any light metal piston makers that could furnish me with pistons that would work in this machine and stop the oil leak?—H. B. Mahan, Williamsburg, Ky.

1.—It is our opinion that the fitting of patented rings would eliminate the trouble which you are having. It has been tried in similar cars and found to work out very satisfactorily. There are several makes of these rings advertised in *MOTOR AGE*.

2.—You could use a light-weight cast-iron piston to good advantage, without any danger of bearing trouble. It might make your engine a little slow on the pick-up but would hardly be noticeable. Refer to the advertising section of *MOTOR AGE* for the names of piston makers.

Why Engine Overheats

Q.—I have a Dodge Brothers car 1918 model, which boils very easily. I have had it cleaned and nothing has been found the matter with it. The clutch is in good condition. Could it be in the timing or what?

2.—What causes a vibration on a Dodge Brothers car when going about 25 m.p.h.? How fast will this car go?—C. W. Hartu, Jr., Hobart, Okla.

1.—There are several reasons why an engine overheats. In the first place, if the car is used continually in hilly country, where much second gear work has to be done, the engine will get hot. But overheating is more generally due to some defect of the mechanism. Of course, if the car is a new one, the parts will be more or less stiff and until the parts have become worn in the engine is apt to overheat, especially if driven at high speeds. Poor oil or not enough oil will cause friction between the cylinder walls and pistons, bearings, etc., and this naturally will cause an engine to run hot. Drain the crankcase frequently; if carburetion has been on the rich side, or ignition not the best, the oil in the crankcase will dilute very rapidly and needless to say makes a poor lubricant when in this state.

Make sure that your water pump is working properly and that the hose connections are not disintegrated. The inner layers are apt to separate, thus restricting the passage through the hose. The result is that the water is not forced through the openings quickly enough, and heats up.

Also make sure that you are not driving on a retarded spark. When the spark is retarded too far the explosion takes place when the piston is far down on the firing stroke and the heat of the explosion is absorbed by the cylinder walls and in turn the cooling water, which, under these conditions, boils. See also that your mixture is on the lean side. An over-rich mixture, aside from being wasteful, makes the engine run hot. Other things to check up on are the fan and belt, which may be too loose, slipping clutch, lack of water, clogged radiator, etc. We are assuming, of course, that you have removed the anti-freeze solution, if you used one last winter.

2—Vibration can be caused by loose bearings, missing engine, improper spark position, incorrect valve timing, engine loose on frame, etc. A car on which the springs are not sufficiently lubricated also will vibrate when speeded up. Generally speaking vibration is caused by some loose members and the only way to remedy it is by going over the whole structure and make sure the bearings, etc., are tight.

Camshaft Drive on Peugeot

Q.—Did the Peugeot racing cars have overhead camshafts or pushrods?

2—Which is the best valve cam drive for speed, chain or gear? State difference, if any.—E. B. Monmonier, Pearce, Ariz.

1—The valve mechanism of the Peugeot racing cars comprises eight intakes and eight exhaust valves mounted on opposite sides and operated by a single camshaft, located centrally between each set. The camshaft is driven off the crankshaft by a train of inclosed gears at the front end of it.

2—Experience seems to show that the best results are obtained from a gear-driven camshaft, where high speeds are to be maintained. One reason for this is that the gears can be inclosed readily and properly lubricated, while with a chain this is not so easy to do. Also, a chain will whip considerably at high speeds and consequently there is danger of breakage. Many of the modern passenger car engines have the camshaft chain driven, which is entirely satisfactory, but where you have an overhead arrangement of the camshaft and have to run a long chain down to the

crankshaft, the construction is not so good. Gears also permit of a little better timing.

Misses on One Cylinder

Q.—I have a Buick, 1916, which is giving me trouble. It will throttle down to about 2 m.p.h. At a speed of 5 m.p.h. it fires all right, but on opening the throttle it will miss on one cylinder about every third or fourth time the engine turns over. On reaching a speed of 15 m.p.h. it again fires all right. I have ground the valves, adjusted pushrods, gone over wiring from distributor to plugs, adjusted and filed the breaker points. Next I tried a new set of spark plugs and overhauled the carburetor, which is a Marvel. Carburetor was all right and also vacuum tank. The engine has good compression on all six cylinders and the car pulls up hills as good as ever when running about 15 m.p.h. I also drained the oil from the crank-

case, washed it out with kerosene and put in new oil. What can be the cause of this peculiar miss?—F. K. Irving, Des Moines, Iowa.

Your trouble is probably due to either a weak valve spring or to leakage between the valve stem and the valve guide. Try either a new valve spring or one from one of the cylinders which is not giving trouble. If this does not remedy the trouble check up on the valve stems and guides. This may be done by squirting gasoline between the valve stem and the valve guide with an oil can. If the engine picks up and runs normally the trouble is at this point and either a new valve or a new guide will remedy it.

Rebuilding

Reader Rebuilds Chevrolet

Marengo, Iowa, Editor MOTOR AGE—Am sending you several photographs of a body I built on a 1917 Chevrolet car. I built the complete body, windshield, top and all. As you will see, the rear compartment opens up and forms a back for a seat and makes it into a chummy roadster for four people. The body is painted a London smoke, a little more of a khaki, fenders and running boards are gray, wheels are cream color, instrument board is golden finish on quartered oak, windshield, steering column, and cowl trimmings are black.—George L. Jacobs.

Builds Himself Unusual Roadster

Julian S. Brown, Detroit, has designed and built an unusual roadster for himself. His latest experimental and special roadster has a 127-hp. six-cylinder engine, 4½-in. bore and 7 in. stroke; 130-in. wheelbase; three-quarter floating rear axle, two high gears, 3 to 1 and 2 to 1. The color is

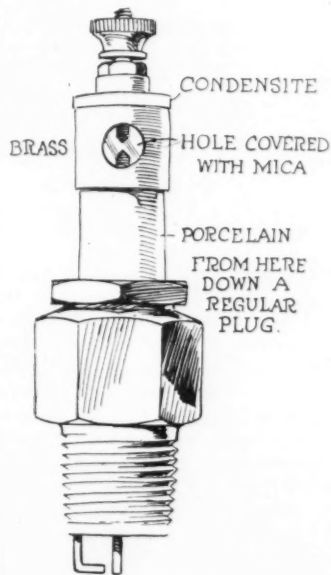


Fig. 7—Plug design submitted by reader

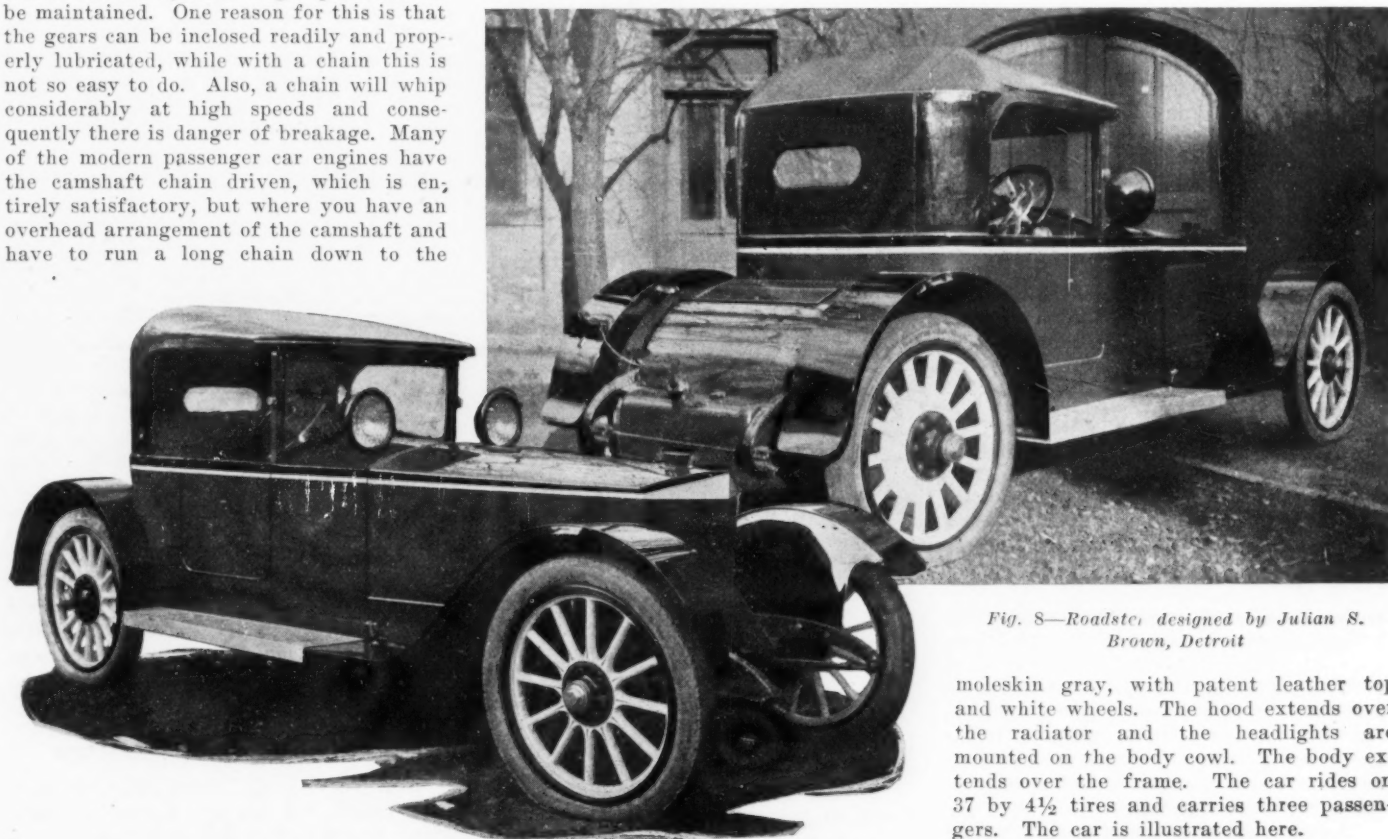
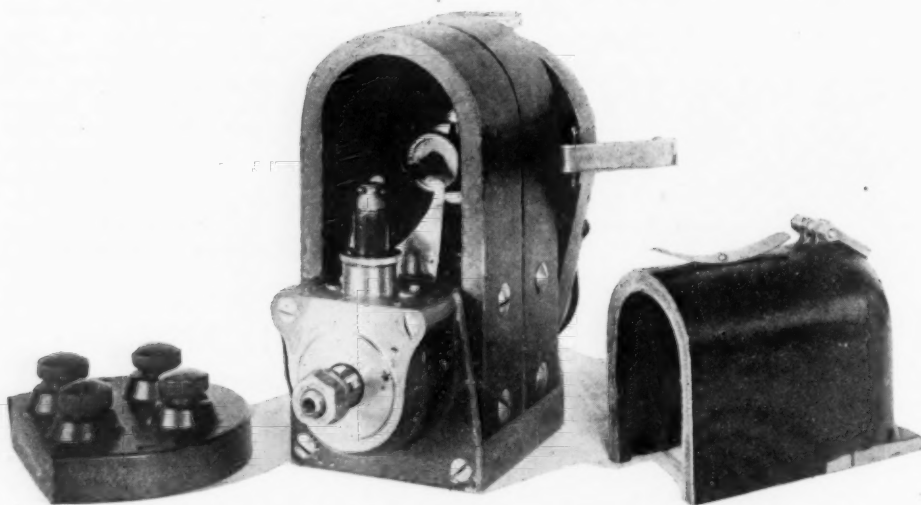


Fig. 8—Roadster, designed by Julian S. Brown, Detroit

moleskin gray, with patent leather top and white wheels. The hood extends over the radiator and the headlights are mounted on the body cowl. The body extends over the frame. The car rides on 37 by 4½ tires and carries three passengers. The car is illustrated here.

Three Lane Truck Models Offered

Two six-cylinder and one four-cylinder in three capacities



Lauraine high-tension magneto which is featured by die-cast aluminum parts

Lauraine Magneto

The Menominee Electric Products, Inc., New York, expects within the next few months to bring out the Lauraine magneto with parts which heretofore have been made of bronze of die-cast aluminum. This, it is stated, will reduce the cost of the magnetos from 10 to 15 per cent. There is no change in the operation of the instrument, which is of the Siemens armature type. The magnets or end plates can be removed without disturbing the waterproofing cover and the breaker housing is provided with two arms, permitting the machine to be linked up from either end. The breaker arm bearing is built up of cross-section fiber working on a pin which is integral with the main breaker block. This is to prevent contraction or expansion from excessive temperature or moisture. An additional feature of this magneto is the distributor gear, which is adjustable for wear through an eccentric bushing.

In addition to the Lauraine magneto this concern also is producing a low-priced generator of 8-volt, 7 $\frac{1}{4}$ -amp, capacity. This can be had in either ampere or voltage control. The latter can be operated without a storage battery, making it especially useful on tractors. The Lauraine generator lists for \$30.

Stewart Vacuum

A special industrial model vacuum tank has been brought out by Stewart-Warner Speedometer Corp., Chicago. The new tank is heavier and stronger than former models and is especially designed for heavy-duty engines—trucks, tractors and stationary types. It has a larger capacity and accelerates the flow of gasoline. It is made in two sizes, one with a round shell of 3 $\frac{3}{4}$ -pt. capacity and one with a D-shaped shell of 5-pt. capacity. A flapper check valve in the gasoline line prevents gasoline from receding when suction is released. This keeps the gasoline line full at all times, and the instant the float chamber empties, the filling process begins.

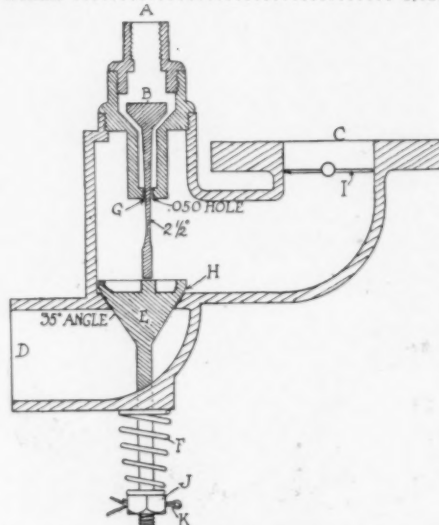
The air vent of the new tank is of the

venturi type, insuring instant action and rapid emptying of the inner tank into the lower or outer shell. The tank differs from former models in the flapper valve construction also, there being two of these in place of one. This makes it possible for the top tank to empty in half the time formerly required. The float is of cork, also a departure from former construction. It is heavily coated to prevent absorption of gasoline. A removable strainer is placed in the gasoline outlet to the carburetor and the tank is supplied with a petcock at the bottom to draw off gasoline when necessary. The price is \$15.

NATIONAL PRICES ADVANCE

Indianapolis, Ind., June 8—The National Motor Car & Vehicle Corp. has increased the price of each model \$300, effective June 1 and as follows:

SIX-CYLINDER		
MODEL		NEW PRICE
Touring	.....	\$3,120
Roadster	.....	3,120
Sedan	.....	3,120
TWELVE-CYLINDER		
Roadster	.....	\$3,050
Phaeton	.....	3,050
Roadster	.....	3,150
Sedan	.....	3,720



Cross-section of Von Hambach carburetor, which is a floatless design

THE truck made by the Lane Motor Truck Co. is offered in three sizes, 1 $\frac{1}{2}$ -, 2 $\frac{1}{2}$ - and 3 $\frac{1}{2}$ -ton. The Lane was one of the first trucks to be equipped with electric starting and lighting and inclosed cab. It uses a Continental engine. The 2 $\frac{1}{2}$ -ton and 3 $\frac{1}{2}$ -ton models use a six-cylinder, while the 1 $\frac{1}{2}$ -ton is fitted with a four-cylinder. The bore and stroke for the three models are respectively 3 $\frac{1}{2}$ by 5 $\frac{1}{4}$, 3 $\frac{3}{4}$ by 5 $\frac{1}{4}$ and 3 $\frac{1}{2}$ by 5 in.

A two-unit system of generator and motor with a Willard storage battery is used for starting, lighting and ignition. The lights are well protected, the headlights being placed 40 in. from the ground in concaves cast integral with the metal dash and the taillight in a recess in the rear cross member of the frame.

Cooling is by centrifugal pump, and the radiator is of the fin and tube construction, bolted together in such a way as to make the cells easily accessible in case of repairs from freezing and so on.

Transmission Amidships

The transmission is mounted amidships on roller bearings and consists of four speeds forward and reverse. The drive is taken through universal joints, which are well protected from dust by close-fitting housings. A dry-plate disk clutch with Raybestos lining is used. The front axle is an I-beam section, drop forged in one piece from 35 to 40 carbon steel. Bearings are used in the top of the steering knuckles as well as in the wheels, making steering easy. A Timken worm-drive rear axle is part of the equipment. Steering gear is Ross fore and aft.

The springs are semi-elliptic. Hotchkiss drive is employed. Both emergency and service brakes act internally upon large area rear wheel brake drums. The wheelbase for the two lighter models is 150 for the 2 $\frac{1}{2}$ and 144 for the 1 $\frac{1}{2}$, with option of 180 in. for special types of service. The wheels are artillery type, 36 by 5 in., dual rear. All models are equipped with Goodrich De Luxe tires.

Other features include stephangers of steel; a 3-in. channel steel bumper, cylindrical gasoline tank under the seat, with capacity of 24 gal. and operating through Stewart vacuum feed. The hood has removable sides. The cabs include windshields, curtains, etc., and the new seat unit with sliding doors is so designed that in bad weather it protects the driver's feet, while at other times the door slides back into the seat box and is out of the way. Equipment includes tool kit, pack, oil can, etc.

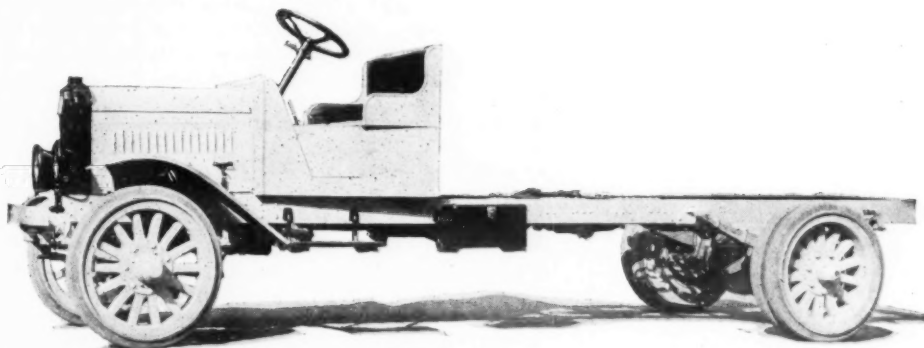
RANIER PRICE ADVANCES

New York, June 7—The chassis price of the model R-4 1 $\frac{1}{4}$ -ton Ranier advanced from \$1,350 to \$1,475 June 1.

Simplicity Marks New Carbureter

Minimum Adjustment an
Outstanding Feature of
Von Hambach

SIMPLICITY combined with minimum adjustment are the outstanding features of the Von Hambach floatless carbureter, recently brought out by E. Von Hambach, consulting engineer and former racing driver. A cross-sectional view of the instrument, giving the basic principle of operation, is shown herewith, and from this it will be noticed that there are only two moving parts, the metering valve and automatic air valve. The fuel enters at A and is held in this chamber by the metering pin B, which rests on the seat when the engine is not running. When the engine is turned over the suction causes the air valve E to lift, which in turn lifts the metering pin, as the latter extends downward and almost touches the air valve. As



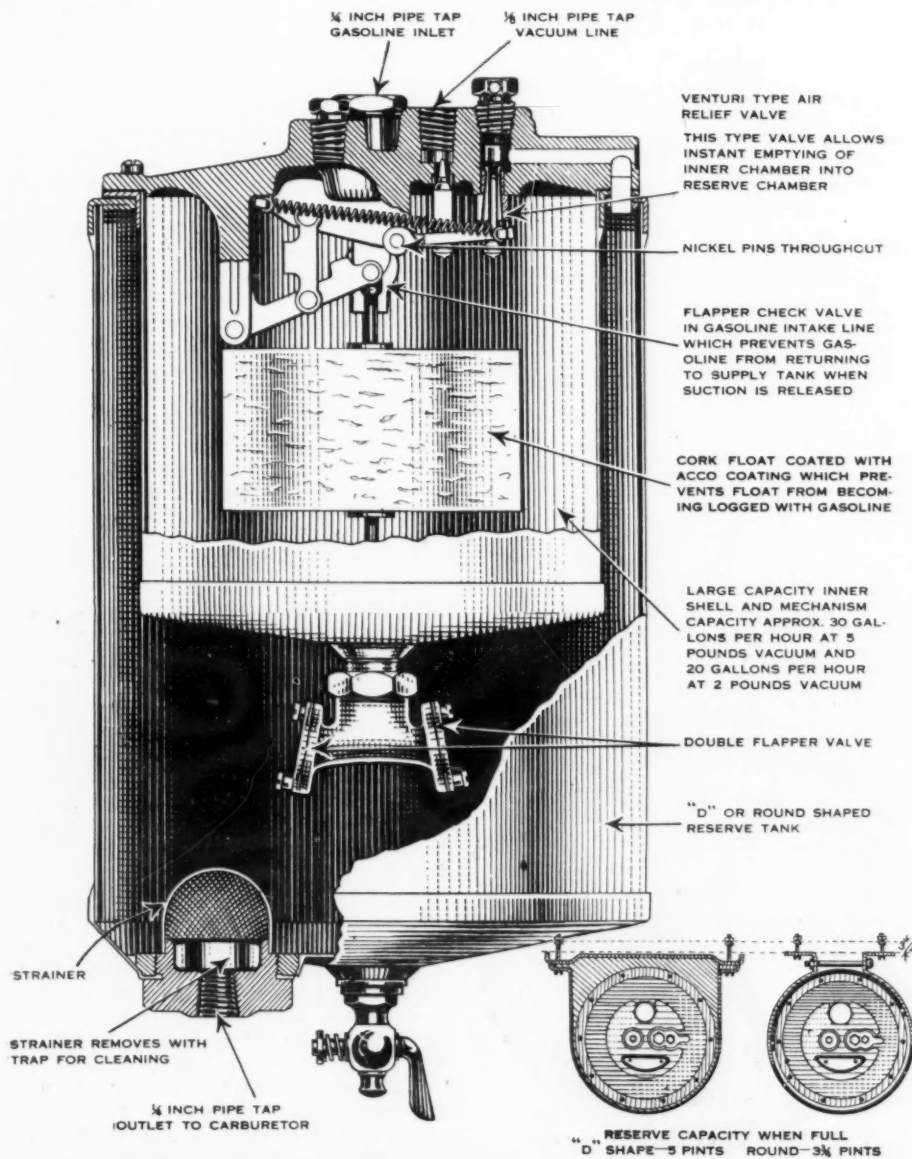
One of the three trucks offered by the Lane Motor Truck Co.

the metering pin lifts the fuel drops into the mixing chamber, but instead of dropping vertically it is swept toward the center by engine suction. Here it is met by the inrushing air, and the mixture is drawn into the cylinders through the throttle I.

The only adjustment is that of the air valve spring F, which is used to give proper idling. Once this adjustment has

been made the ratio of gasoline to air is the same throughout the entire engine speed range. This, it is stated, was verified recently by a test using a ratio of fourteen parts of air to one of gasoline.

The top of the air valve is cupped, allowing a small puddle of fuel to rest there for easy starting. This fuel can be introduced by a lever operated by the driver, which raises the air valve slightly and, in turn, the metering pin. By use of three-way cock at the fuel entrance, the carbureter can be used for either gasoline or kerosene and, should the operator be running on kerosene and forget to switch to gasoline before stopping, what little kerosene is left in the reservoir above the metering pin easily can be run out by flooding the carbureter and turning on the gasoline.



Industrial model of Stewart vacuum tank which is for heavy-duty engines

PROGRESS IN VALVE MATERIALS

Some years ago valve materials were confined to cast iron head, nickel steel head, some solid nickel, such as 35 per cent nickel, and machinery steel. But now valves are made in several different steels, including 3½ per cent straight nickel steel, chrome nickel steel of various analysis, chrome vanadium and other special alloys, not to mention the high and low tungsten steels and, just lately, some special high chromium steels.

As most strenuous service for valves is found in airplane engines, what is typical of modern practice can of course be found in this use. The type of valve used in airplane work is always of the solid forged, one-piece type, and it generally is made of one of the many grades of alloy steel. The high-grade trucks are quite similar in this respect.

When an engine is designed the materials for valves have much to do with the location of the valves, the shape of the gas passages, the shape of the combustion chambers and the speed characteristics of the engine. Almost as important as material is the question of design of the valve itself, and valve manufacturers are almost unanimous in the opinion that there has been a betterment along this line in the way of a better proportion between stem diameter and head diameter. It generally is believed by valve manufacturers that a great amount of service can be gained by keeping a fair proportion between the size of the head and the size of the stem to give a

valve mechanically stronger. As far as manufacturing is concerned, difficulties have been solved by making valves more uniform than they used to be.

Spring retainers are now better, due to European influence to a great extent. The better retainers are using a groove or have the valve stem threaded either on the inside or on the outer diameter. Valves are designed for lighter weight, and better distribution of material gives a stronger and more substantial valve in service. In the welded type of valves where the head is of one material and the stem another the importance of an inseparable joint between the head and stem cannot be exaggerated.

A new valve which has been tried out extensively has a mercury cooling feature. This valve is the invention of C. F. Kettering of the Domestic Engineering Co., Dayton, Ohio. It is intended particularly for exhaust valve purposes on farm lighting plants, and is being suggested as practical for airplane purposes. It is pointed out in the explanation of this valve that the temperature of the exhaust gases is about 1800 deg. Fahr.; with this temperature a racing or airplane engine very frequently runs with a valve stem red hot, due generally to the limited radiation of heat absorbed by the valve guide. For this reason engines of this type have necessarily had to use the best heat resisting alloy steel in the construction of their valves, and even with the use of the improved steel it has been found difficult to construct the valves so that they will operate for more than 100 hr. under this class of service without regrounding.

Mercury Cooling Feature

It is to meet this situation that the Delco-Light mercury cooled exhaust valve was brought out. It is claimed that with this type it is not necessary to regrind after months or years of continuous service and that warping of the valve is eliminated.

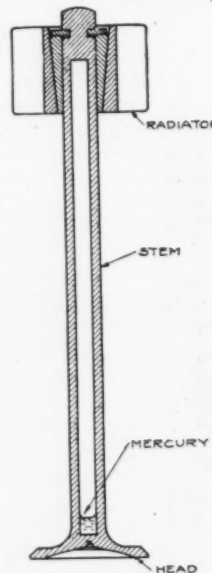
The mercury, as shown by the illustration herewith, is contained within the valve and the effect is to transmit the heat from the hottest part of the valve up to the portion of the valve stem which is exposed to the atmosphere. In this particular installation the valve stem is fitted with a series of radiating fins to facilitate the cooling of the valve. The mercury under normal temperatures is in a liquid state and rests at the bottom of the valve stem. As the heat

is absorbed by the valve stem and transmitted to the mercury, the mercury is vaporized and immediately rises until into contact with the cooler part of the valve stem, when it condenses and flows back to the bottom of the stem to repeat the operation.

In the improved construction of the valve, the tubular stem is welded to the head. The mercury then is poured into the hollow stem and the top of the valve plugged and welded to make an air-tight joint. The aluminum radiator, which is secured to the top or exposed end of the valve stem is held in place by a split tapered sleeve.

ROBERTSON CRADLELOCK WHEEL

The Robertson Cradlelock Wheel Co., Chicago, has brought out a spring wheel wherein the shock-absorbing and cushioning elements are located remote from the hub. In this manner the axle and fixed spokes can move continuously through a plane paralleling the road surface and in what might be said a floating condition within the self-adjusting rim surrounding these spokes. While the rim of this wheel may yield to accommodate obstructions and relative depressions and elevations in the road bed, it is said such a yield is not



Sectional view of mercury-cooled exhaust valve made by Domestic Engineering Co.



Two views of Robertson spring wheel with shock-absorbing elements

loose or tremulous but will be more like a rolling axle around the ends of the spoke. The wheel also utilizes the principle of flexibility, suspending the load within the rim and parallel to the line of force applied to the rim. For example, the spring suspension is so formed and the point of attachment of the springs so arranged that throughout the circumference of the wheel the load normally is supported by the yielding resistance of the springs in vertical planes or at right angles to the road surface. On encountering an obstruction which changes the point of application of pressure on the rim, the suspension springs, it is said, will act automatically to suspend the load in planes parallel to the changed point of application of the force. This wheel will be brought out for trucks as well as passenger cars.

LETTER FROM TOKIO DEALER

The following is from a letter received by Hi Sibley of the Republic Truck Co., Alma, Mich., from a motor car firm in Tokio, Japan:

"We are quite interested in motor trucks but all the American manufacturers seem to be impossible to do business with on account of their various and numerous demands. They want this and they want that until it is far too much trouble to do the business. To cite an instance: One of the principal makers at our solicitation sent us their contract which we were quite satisfied with and which we signed and sent them their copy of the contract, they on their side having already signed it. We sent them an order and supposed that everything was O. K. About three months later they sent us the original contract with two additional clauses tacked on. One was that they would reserve the right to do all government business and the second was that we would have to agree to take a certain number of cars before the end of the first year of the contract, which by this time had only three months to go, as they made the contract good for only one year in the first instance. So we simply dropped the whole business as we did not consider it worth our while to work for a concern who would do such things.

"Since then we have not thought it worth while to find another maker, as they all seem to be tarred with the same brush. On account of the demands made by both of the pleasure cars whom we represented while you were here as to the number of cars we would guarantee to take the first year we dropped them both. I will not guarantee anything without fulfilling our contract even if the market went against us. Now these two makers have firms here—native—who have complied with their demands and it remains to be seen if they live up to them. As long as there is a good demand for cars all will be well but they will not go out and chase business if things go against them. With due respect to you I do not think that your company will be any different and, therefore, I am not very enthusiastic. Just at present we are dickering for 300 trucks for immediate delivery but do not think it will come off.

"The market here is simply swamped with second-hand cars of all makes from all parts of the states but principally from Honolulu. There are about 1550 cars in Tokio now."

The Owners' Repair Shop

Removing Deposits from Radiator

MOTORISTS should not be alarmed when the water of the cooling system boils occasionally. There is no harm done, and besides the engine is operating at very nearly the most efficient temperature, which is just below the boiling point of water. Continual overheating, however, must be looked into. It is not likely that a new car will give trouble, but in the older models the radiator and waterjackets may have become clogged with deposits, causing the water to boil easily, especially when the engine is pulling hard.

Assuming the deposits light, the following is the way to go at the job:

1—Dissolve 1½ lb. of common washing soda in 2 gal. of water and, keeping this proportion, make enough solution to completely fill the system. Mix it in a wash boiler and keep it at about the boiling point on a stove.

2—Drain water from radiator; close drain cock.

3—Remove fan belt; this keeps the solution hot with engine running.

4—Fill radiator with soda solution and let the engine run for about 10 min., if the engine has a pump. If thermo-syphon system is used, run longer, say 20 min. This gives the solution a chance to thoroughly clean out the jackets and radiator.

5—Stop engine, drain off solution and refill with clear soft water.

Repeat if Necessary

If this treatment has not removed all the lime deposits, it may be necessary to repeat the operation in a day or so. In fact it generally will be found that if the treatment is applied again in a few days, much more deposit can be freed. Lime deposits act as an insulator, with the result that heat is not carried away properly when the air strikes the radiator fins.

In very bad cases the acid treatment can be used and should be applied as follows:

1—Make a solution of hydrochloric acid and water, using one part acid to eighteen of water.

2—Have on hand a soda solution, made in the proportions as above, keeping it hot.

3—Drain system and close drain cock.

4—Pour in the acid solution and let the engine run as before, allowing a longer period for thermo-syphon systems.

5—After running engine for required period, drain off solution and immediately pour in the soda solution. The purpose of the latter is to neutralize the acid, should any remain in the radiator. Run the engine with the soda solution for several minutes and drain.

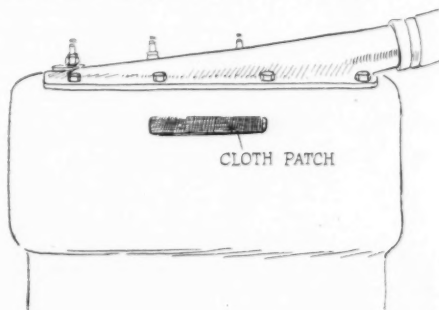
6—Refill system with clear soft water.

7—Replace fan belt.

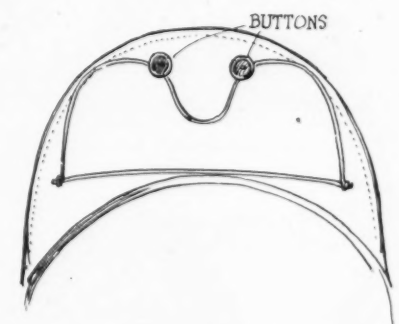
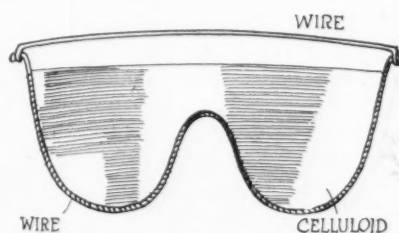
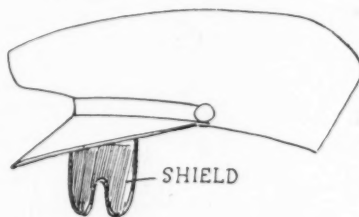
Baby Hammock

North Loup, Neb., Editor MOTOR AGE—A hammock for the baby may be made eas-

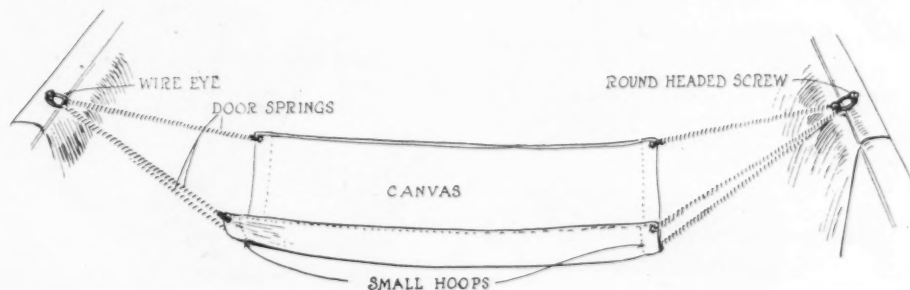
ily to fit within the rear of a touring car. A small wood hoop from a keg is cut in halves and these are then sewed into the ends of a length of canvas 2 ft. or 30 in.



Cloth patch for waterjacket



Construction of home-made eye shield



How Motor Age reader would construct baby hammock for car

long, depending somewhat upon the width of the car. Two or three door springs are cut to stretch taut from the ends of the hammock to the sides of the car, and fastened securely to the hammock with small wire. The ends are held together by a wire eye which slips over the round-headed screw in the top of either side of the car body. The hammock may be removed and folded into a compact bundle when not in use.—Dale R. Van Horn.

Eye Protector

A simple eye shield to attach to a cap can be made out of a piece of amber or other colored celluloid by cutting it to fit a wire frame, as shown. The top of the frame should be made of No. 14 wire, long enough to extend nearly across the visor of the cap, with a loop at each end. The other wire is copper, somewhat heavier, and the ends are looped. This prevents the ends from coming out. The celluloid then is sewed to the frame and the edges trimmed. The straight wire is sewed to the visor. Buttons placed as shown hold the shield up when not used. Since the frame should fit snugly it is better to try it before putting on the celluloid.

Repairing Waterjacket

Here is how one reader repaired a cracked waterjacket, after a cold snap had caught the radiator and jackets full of water. The radiator was forced open at the bottom but fixed in the usual manner by soldering. There was an ugly crack along the top of the cylinder jacket, on the valve side. The only permanent remedy was welding, but as the car was wanted immediately a temporary repair was made as follows. The crack was first thoroughly cleaned and wiped dry. Hard putty was then forced into it by a toothpick. The surplus putty was scraped off and the surface coated with shellac and allowed to set. Over this coat another was applied and a strip of muslin pressed on, the latter being also coated. When perfectly dry the edges were trimmed and a final coat of shellac applied. Later the whole block was given a coat of engine enamel and the patch is hardly noticeable.

The Accessory Corner

Liberty Siren

THE Liberty siren is a device for attachment to the exhaust manifold under the hood of passenger car, truck or motor boat. It operates by the pull of a cord which is attached to the dash or steering wheel column. The siren plays sixteen notes and is likened to the sound of a mocking bird. A melody can be played by pulling the cord. Price, \$3.50.—Liberty Accessories Co., St. Louis, Mo.

Wheel Side Carrier

The H-S side carrier for demountable wheels has a center support and is equipped with bolts for attachment to the side of the car and running board. The carrier is substantially made and is installed in a very short time, it is said. Price, \$3.—Hill-Smith Metal Goods Co., 82 Brookline avenue, Boston, Mass.

Carbon Resistance Unit

The France variable carbon resistance unit is designed to meet the need for a long low-rate reforming charge to a battery. Small motorcycle, mine and hand lantern storage cells require a low ampere charging rate because of their low ampere-hour capacity. Used with the F-F Battery Booster the rheostat will give any ampere charging rate between a very low rate and maximum current output of the rectifier simply by moving the spring clip along the carbon rods. This resistance is non-corrosive and infusible, cannot melt, disintegrate or break from overload or continuous service, it is claimed. The shipping weight is about 5 lb. Price, \$6.—France Mfg. Co., Cleveland, Ohio.

No-Leak-O Ring

The No-Leak-O Special differs from the standard model of this piston ring in that the narrow edge forming the groove is trimmed off about $\frac{1}{8}$ in. so that on the up stroke the surplus oil is dumped quickly, preventing it from getting past the ring. The device is oil sealing. A groove full of oil is carried between the ring and the cylinder wall, and it is claimed the gas can-

not possibly pass this. If the top ring is reversed it will prevent the refuse of gasolene from working down into the oil pit, which is injurious to lubrication, it is claimed, and on the up stroke the square edge forming the groove catches any refuse that attempts to pass, while on the down stroke this refuse is pulled from the groove back into the firing chamber by capillary attraction and the refuse is vaporized into gas rather than getting into the oil pit and injuring lubrication. Automobile Ac-



Versal Mobilpower converter

cessories Co., 824 West North avenue, Baltimore, Md.

Borst Truck Chain

The Borst anti-skid chain for motor trucks is made up of flat, ground-gripping links which are made into a chain that passes over the truck wheel and an auxiliary wheel. The use of the auxiliary wheel is the novel part of the device. This is a revolving drum fitted on a bracket which is attached to the side of the frame. The bracket and drum arrangement is equipped with a tension spring by which the slack of the chain is adjusted. Two of these devices, one for each rear wheel, are needed for each truck making the installation. The chains are built to fit a 6-in. single tire and a 12-in. double tire. Other sizes are being developed. A. J. Borst, Jr., Buffalo, N. Y.

Traffic Signal Arm

The M & M traffic signal arm is an electric device which operates by the pressing of a button. It is used to indicate turning and can be locked in place for as long as the driver wishes. Pressing the button will raise the correct arm, which will stay in place, extended as the arm of the driver would be in signaling, and pressing it a second time will lower the arm. Price, \$15.—M & M Electric Auto Signal Arm Co., Minneapolis, Minn.

Star Gas Tite Ring

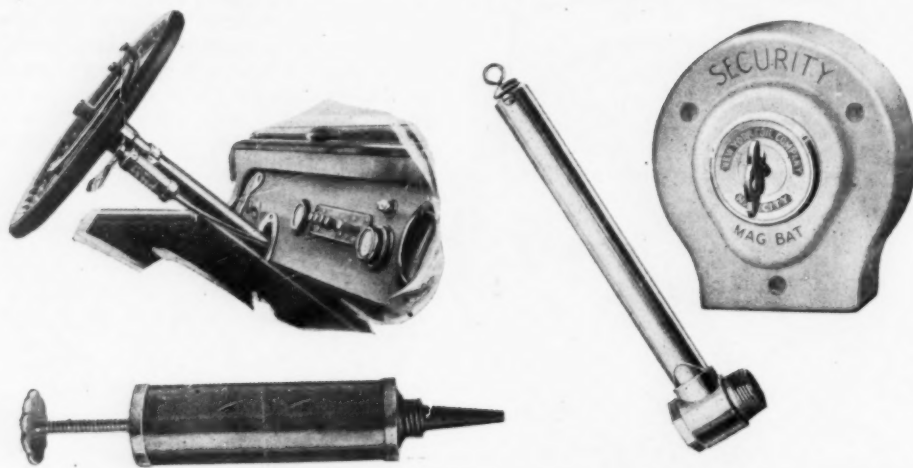
The Star Gas Tite piston ring has only one additional piece as compared to the plain piston ring, this addition being the long tongue which is securely pinned in place into an accurately cut slot. This arrangement allows absolute freedom for expansion and seals the opening at all times. The ring is made of a uniform thickness throughout and is designed for the Ford car. Price, 80 cents each.—Star Specialty Mfg. Co., 227 West Erie street, Chicago, manufacturer; Standard Motor Parts Co., 1420 South Michigan avenue, Chicago, general sales agent.

Consolidated Automatic Oiler

The Consolidated oiler operates automatically, being equipped with a ball valve which is upset by the vibration from the motion of the car. This ball valve checks the flow of oil when the car is at rest but maintains a flow when the car is in motion. As the upsetting action on the ball is more or less in proportion to the vibration the oil will flow more freely as needed for higher speed or rougher road. The construction of the oil cup is simple. The ball valve is held within an internal cup, which keeps it seated except when the motion of the car shakes it about to a sufficient degree to permit the oil to escape past the valve into the wick feed leading to the bearings. Consolidated Machine Co., Detroit.

New Fulton Oiler

The new Fulton oiler is fitted with an exterior casing of heavy gage steel which houses the internal container, which is a



Above, Eco headlight controller installed on steering wheel; below, Shields grease gun; center, Liberty siren; and, right, new Security lock

Sylphon. The construction of the Sylphon forces the oil out, or, when it is allowed to expand, the oil can be drawn in. Ordinary filling is by a filler cap on the outside of the casing. A ball catch valve is lifted from its seat by a stem on compressing the Sylphon, and a spring surrounding this stem brings the Sylphon back to its original position upon releasing the pressure. The advantages of the oiler lie in the absence of spring bottoms and pumps, pistons or valves, it is said. Neither are there any soldered or brazed seams. Price, \$1.50.—Fulton Co., Knoxville, Tenn.

Security Switch Lock

The new Security switch lock for Ford cars consists of a strong alloy metal housing that completely covers the switch supplied as standard equipment. The housing is secured by removing the name plate on the molded switch or the complete metal covering on the 1918 switch and applying the device by three screws. The first turn of the key causes a cam to force out two metal bars which completely cover the screw heads, making it impossible to remove the screws. These bars do not operate at each turn of the switch but remain in place over the screw holes. A bronze contact spring is fastened to the cam, and when the key is removed it makes contact with the central member of the switch, which grounds the four coils, making it impossible to wire around or make an external connection to operate the ignition system even with a separate battery. A non-pickable barrel lock type is supplied with two keeps, as well as all screws and fittings for installation, which, it is claimed, can be made in less than 5 min. with an ordinary screwdriver. Finish is enamel and nickel. Price, \$3.25.—New York Coil Co., 338-340 Pearl street, New York.

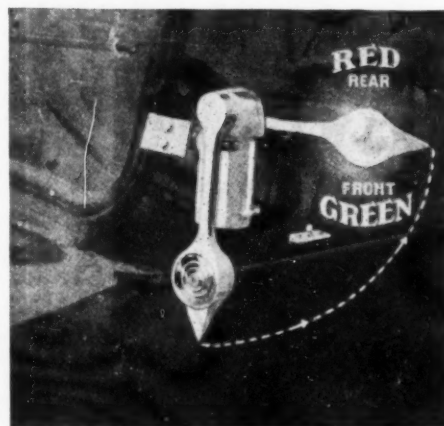
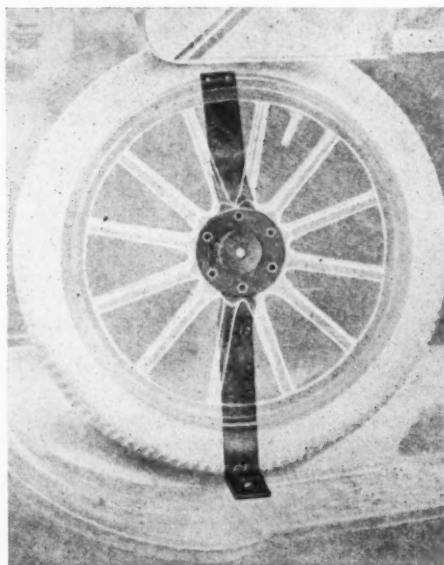
Shields Grease Injector

The Shields grease injector holds 1½ lb. of grease to a charge. It is made of steel, finished in black enamel, with nickel-plated ends and handle. The screw is of the square head type, five threads to the inch, enabling the operator to use as much or as little grease as may be desired and also to withdraw the plunger quickly when the cartridge is empty. The cartridge for the injector carries 1½ lb. of grease put up in any standard grade or of best quality. It fits inside the gun and is made of material that under all conditions is perfectly clean to handle, it is claimed. Price, \$2.50.—Wheless-Wilson Auto Supply Co., Shreveport, La.

Mobilpower Converter

The Versal Mobilpower converter can be used to operate machines such as buzz saw, water pump, silo filler, hay press, corn sheller, grist mill, concrete mixer, elevator, irrigation pump, drill press, etc. It is built of structural steel, channel and angle iron and weighs about 90 lb. The cross shaft is of high-grade steel, running in two 5-in. babbitted bearings which are lubricated by large grease cups. Each converter is supplied with two belt pulleys, built integral with the driving pulleys. They are 4 in. in diameter with a 5-in. face at either end of the driveshaft, making it convenient to connect the belt to whatever device it is intended to drive. The con-

verter is prepared for service by sliding it under the rear axle of the motor car and pushing down on the rear end. This has the effect of a jack and raises the car off the ground and allows the axle to slide down the steel supports until the rear wheels of the car are in contact with the



Above, H-S side carrier for demountable wheel; below, M & M traffic signal



Star Gas Tite piston ring

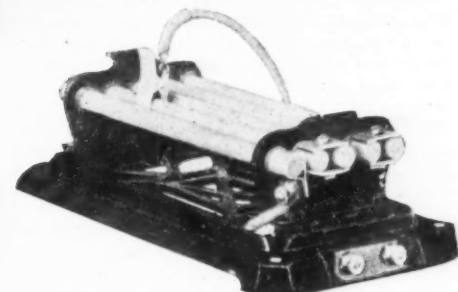
converter driving pulleys. No change or attachment on the car is required. The converter can be placed on the running board of the car and held there by the driver until transferred to the place where it is wanted. After the car is mounted on it, start the engine and throw the transmission gear in high. Let the clutch in slowly. This will drive the rear wheels, which in turn will drive the driving pulleys of the converter, transmitting the power to the machine or apparatus to be operated. Price, \$28.50.—Versal Products Mfg. Co., Detroit.

Headlight Controller

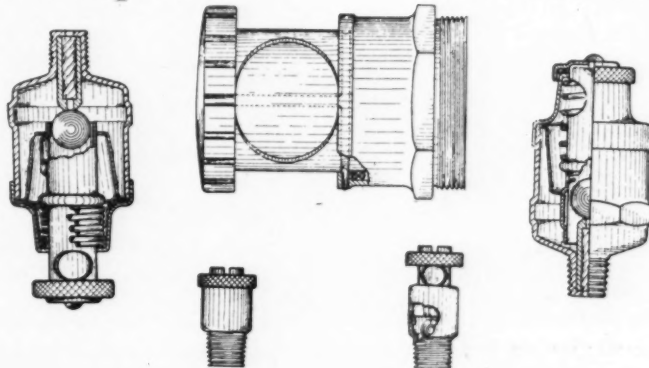
The Eco headlight controller makes it possible for the driver of a car with this installation to control the light distribution without removing his hands from the wheel. The device governs the amount of current, which regulates the amount of light. A lever under the steering wheel is the controlling medium. The device comes equipped with a spring clamp to fit around the steering post. Price, \$7.50.—Western Mfg. Co., Oskaloosa, Iowa.

Blaxshine Car Finish

Blaxshine is a car enamel that, it is claimed, will dry over night and will not crack or chip. One coat is said to be sufficient for black and two coats for other colors. A black, glossy finish is produced, and the enamel can be washed with warm or cold water without injury. The enamel also is adapted for enameling hoods and radiators, as it will stand up under a very high degree of heat. The special package contains 3 pt. of the finish, put up in 1-in. screw-top round can, one extra fine brush set in rubber, sandpaper, steel wool and a suitable cup to pour the enamel into, with the initials of the car owner in gold for application to each side of the car, if desired. It also is furnished in other quantities, from ½ pt. to 1 gal. Price, \$2.85 a package.—Twin City Varnish Co., 208 North Wabash avenue, Chicago.



France carbon resistance unit



Exterior views and construction of Fulton oiler

Among the Makers and Dealers

L UVERNE Builds Truck Units—The Luverne Automobile Co., Luverne, Minn., maker of motor fire apparatus, is offering a full line of truck unit parts for all types and sizes.

Palmer Plant Is Leased—A lease of the former plant of the Palmer Mfg. Co. has been made to the Everitt Bros. Co., body painter and finisher. The plant embodies about 40,000 sq. ft.

Marvel Accessories Adds Space—The Marvel Accessories Mfg. Co., Cleveland, Ohio, has acquired the top floor of a four-story building, giving the company an additional 15,000 sq. ft. of floor space.

Boone Tire to Build in Texas—The Boone Tire & Rubber Co. is having plans prepared for the construction of a plant at Waco, Tex., for the manufacture of motor car tires and tubes. The factory will have a daily capacity of 750 tires and 750 tubes.

Kelley Leaves Signal for Government—A. D. Kelley, assistant general manager of the Signal Motor Truck Co. and formerly connected with the Chalmers Motor Co. and Dodge Brothers, has resigned to become associated with the Government June 1. His duties will not take him away from Detroit.

Stairs Directs Harroun Ordnance Work—J. A. Stairs has been appointed general superintendent of ordnance production at the Harroun Motors Corp., Wayne, Mich. He was formerly vice-president of the Eastern Steel Co., New Glasgow, Nova Scotia, and during the last three years has been specializing in ordnance production.

Waltman Joins Hupp Motor—C. M. Waltman, formerly general superintendent of the Waidley Motors Co., has been appointed assistant to the vice-president of the Hupp Motor Car Corp. in charge of production. He is well known in the motor car industry as production superintendent and also as famous driver for Glidden tours, hillclimbs and economy tests for the old Premier Motor Co.

Northway Plant Placed Under Oakland—The Pontiac, Mich., unit of the Northway Motor & Mfg. Co., which hitherto has been controlled and handled by the Detroit offices, has been placed under direct charge, and will operate as a unit, of the Oakland Motor Car Co., Pontiac. The change has been made to bring about greater concentration and also to relieve the Detroit offices of a large amount of work entailed under the

former system of control of the Northway plant. The Northway plant employs 1000 men and women. The schedule output is now 300 engines daily.

R. C. Hupp Is Dead—Robert C. Hupp, one of the organizers of the R. C. H. Corp. and a few years ago an outstanding figure in the motor car world, died May 24 in Cumberland, Md.

Packard Motor Car Co.—The Packard Motor Car Co. has declared the regular quarterly dividend of 1½ per cent on preferred capital stock, payable June 15 to stockholders of record at the close of business May 31.

E. A. Scheu of King Advanced—In addition to his present position as eastern district sales manager, E. A. Scheu will take on the duties of president and general manager of the King Car Corp., the New York branch of the King eight.

New York Office for Grossman—The Emil Grossman Mfg. Co., Brooklyn, N. Y., has opened an office in New York for the transaction of export business primarily. All its products will be on display there, and jobbers and dealers are invited to the office. Sidney S. Frank will have charge of the office.

Boulcott Back with Delco—W. C. Boulcott has been made advertising manager of the Dayton Engineering Laboratories Co., Dayton, Ohio. This is Mr. Boulcott's third connection with the organization. A few months ago he left the United Motors Service, of whose Chicago branch he was manager to join Cadillac, which he leaves to return to Delco.

Mason Tire Sales \$501,540.25 in Quarter—Mason Tire & Rubber Co. sales for the quarter ending April 30 were \$501,540.25. Net earnings for the second quarter were \$62,234.02. After allowing for preferred dividend requirements for the period more than 25 per cent is applicable to the common stock.

C. A. S. Products Will Rebuild—The C. A. S. Products Co., Columbus, Ohio, will erect a factory building 90 by 200 ft. on its 2½-acre tract. The plant is to be ready for occupancy July 15. The company will erect additional buildings so that the production of the present plant will be quadrupled.

Leigh Now with Hackett—R. L. Leigh has been appointed general sales manager and will also become a director of the Hackett Motor Car Co., Grand Rapids, Mich. He formerly

was supervisor of eastern sales of the Reo Motor Car Co., Lansing, Mich., and later acted as division sales manager for the Olds Motor Works.

Peninsular Buys Factory Site—The Peninsular Milled Screw Co., Detroit, has acquired 10 acres of land on which it intends to erect a factory building covering half of the property next year.

Pennsylvania Rubber Co.—The Pennsylvania Rubber Co., Jeanette, Pa., has declared its regular quarterly dividend of 1½ per cent on preferred stock and 1½ per cent on common stock, payable June 29 to stockholders of record June 15.

Agnew Joins Liberty Agency—W. L. Agnew, formerly advertising manager of the Hudson Motor Car Co., Detroit, and later with Chalmers in the same capacity, is now connected with the Moore Motor Co., distributor of the Liberty car at Columbia, S. C.

Wallis Tractor Fire Loss—The plant of the Wallis Tractor Co., Racine, Wis., was damaged about \$20,000 by fire May 20, but production is going on at practically the same rate as before. The burned structure will be replaced at once and new machinery and equipment already has been ordered, so that little interruption will result.

General Motors to Build Foundry—The General Motors Corp. is planning to establish a gray iron foundry at Saginaw, Mich., that will employ close to 1000 men to start with. It will be built immediately north of the old Marquette plant and will occupy buildings 600 by 1400 ft. This plant will supply part of the requirements of all the various subsidiaries of the General Motors Corp.

Frushauf Showing Increases—The Frushauf Trailer Co., Detroit, has enlarged its dealer organization and now has representatives in all states. It reports that business is increasing rapidly. Last February was the biggest month the company has ever had, but it doubled that business in March, when it secured \$48,000 worth of business. The company is manufacturing twelve different styles of trailers for various lines of business.

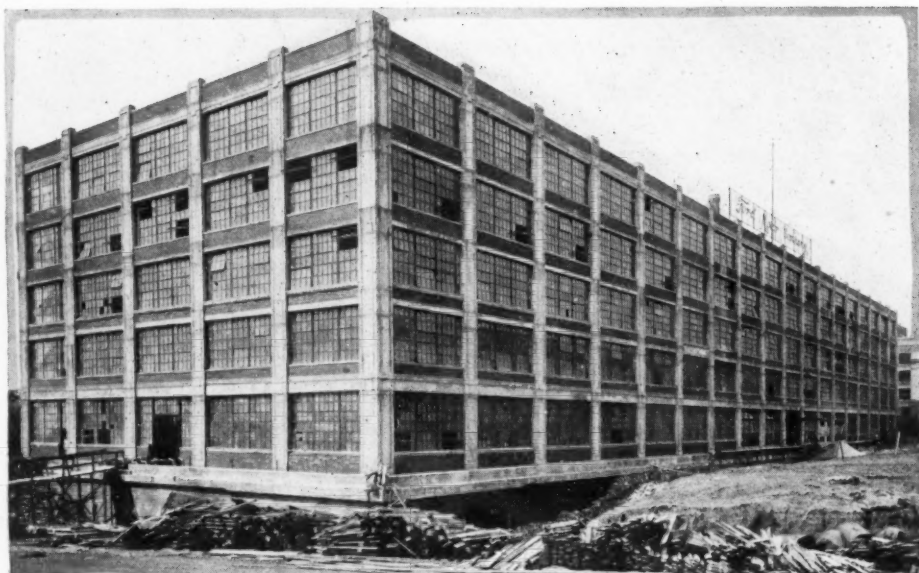
Lewis-Hall Erecting Addition—Lewis-Hall Iron Works, Detroit, manufacturers of the Hall truck, are erecting a one-story frame building 150 by 190 ft. to be used for assembling. The company reports very good business in the east, especially in the New England states. It just completed an order for six trucks to be sent the Government. The trucks were shipped to Fort Misslin, Pa. The company's output is forty-five trucks a month.

Hackett at Work on Factory—Work on the new factory of the Hackett Motor Car Co., Burlingame, Mich., which will be comprised of four units, is under way. Three units will be 70 by 500 ft. and have a floor space of 35,000 sq. ft. each. They will be built parallel and will be linked together at the end by the two-story fourth unit, 60 by 400 ft., or main building, which will contain executive offices, stockrooms, experimental departments, etc. The total floor space of the entire four units will be 180,000 sq. ft. and will give a daily capacity of 100 cars.

Makes Them Pay for Delivery—T. K. Hays, a motor car distributor of Bloomington, Ill., has reached the conclusion that most garage owners who do a storage business overlook a point that should be taken into consideration in dealing with patrons. He has intro-



PATRIOTIC TALKS AT CURTIS FACTORY—This is one division of the employees of the Curtis Pneumatic Machinery Co., St. Louis, Mo., listening to one of the patriotic talks that were given daily during the Liberty Loan and Red Cross campaigns



DES MOINES FORD BRANCH IN \$1,000,000 PLANT—The Des Moines, Iowa, branch of the Ford Motor Co. has a \$1,000,000 assembly and service plant now. The new plant is 453 by 120 feet and is so built that it can be converted for manufacture

duced a distinction between the customer who drives his own car to the garage for storage and then comes after it again and the one who telephones or otherwise sends word to the proprietor to send after the car, or after it has been in storage to send someone home with it. In other words, a different rating in charges has been introduced. The time of the employee utilized to go after or take home a storage car is always added to the charge. Formerly this item of expense was not considered and possibly has been overlooked by other garage owners.

Shuman with Vacuum Muffler—Charles S. Shuman, for many years with the Klaxon horn organization and recently manager of the motor car department of the Standard Metal Mfg. Co., Newark, N. J., is now sales manager of the Vacuum Muffler Corp., New York.

Ohio Jobbers in Quarterly Meeting—The first quarterly meeting of the Ohio Automobile Jobbers' Association since its organization at Columbus Feb. 9 was held in Columbus recently. Steps for affiliating with the National Asso-

ciation of Automobile Accessory Jobbers have been completed. A report by the committee on standardization recommended that all packages be made a standard size whenever possible and that the packing be made the same. The next quarterly meeting will be held in Cleveland in August.

Maxwell Opens Canadian Factory—The Maxwell factory at Windsor has opened, and all Canadian trade is being handled from there. The capacity at present is thirty to forty cars per day.

Philadelphia Trade Collects \$87,000—The seven-day war chest drive by the motor car and allied trades group in Philadelphia, Pa., resulted in pledges totaling \$84,695.87. The campaign was continued, and so far \$87,000 has been subscribed. The quota for the trade is \$150,000.

New Bohn Foundry Making Headway—The factory being built by the newly-organized Charles B. Bohn Foundry Co., Detroit, will be 300 by 300 ft. and will have an output capacity of 40,000 to 50,000 lb. of castings daily. The company is capitalized at \$300,000 and the

A MECCA FOR THE MOTORIST

(Concluded from page 7)

are opened, and also a grove on the Fifth avenue road south of LaGrange.

The large tract southwest of Chicago, mostly lying in Palos township, is the pick of the lot, chiefly because its real hills afford such a delightful contrast to the flatness of the old swamp upon which Chicago has grown. Its sloping side faces the Archer avenue road, which is here, for several miles, excellently paved. The most direct route from Chicago is to follow nearest paved east-and-west street from the south side, or the nearest paved north-and-south street from the north or west sides of the city, until these intersect Archer avenue. It is much more pleasant, however, to go west first, through several suburbs, then south through the open country. Striking Washington boulevard at Crawford avenue follow it west, with a slight jog in River Forest, going north to Lake street and following Lake street across

officers are: Charles B. Bohn, president; W. N. Krug, vice-president; H. W. Holt, secretary and treasurer; O. F. Flumerfelt, manager.

Burch Goes with Clyde Cars Co.—A. C. Burch, who recently resigned from the Signal Motor Truck Co., will become associated with the Clyde Cars Co. as vice-president. He will assume his duties June 1 and have complete charge of sales.

Prewett Is Willard District Manager—H. M. Prewett has been appointed district manager for the Willard Storage Battery Co. with headquarters at Detroit. He succeeds S. S. Jenkins, who has been made district manager, manufacturer's sales.

Miner to Represent Duplex Truck—Fred J. Miner has been appointed district representative of the Duplex Truck Co., Lansing, Mich., with territory in the Southeastern states. Mr. Miner assisted in the early development of the Duplex at Charlotte and is one of the industry's pioneers.

Moline Motors Buys Ogden—The Moline Motors Appliance Co., East Moline, Ill., has purchased the machinery and business of the Ogden Motor Car Accessory Mfg. Co., Plymouth, Ind., which has been making swivel joints, fiber gears, flexible driveshafts and other accessories.

Shuler Axle to Move Plant—The Shuler Axle Mfg. Co. has acquired a plant in Louisville, Ky., with 40,000 sq. ft. of floor space and will move its plant to that city from Detroit. Employment will be given to 100 mechanics from the start. The company is incorporated for \$150,000 and was established two and a half years ago.

Rich Tool Transfers Smith—J. H. Smith, manager of sales of the motor parts department of the Rich Tool Co., will make his headquarters in Chicago after July 1, and all sales will be handled from there. Mr. Smith has been making his headquarters in Detroit for the last three years. H. G. Johnson will represent the sales department in Detroit.

Potter Heads American Truck—Col. Joseph D. Potter has been elected president of the American Motor Truck Co., Newark, Ohio. The financial end of the business has been taken over by the R. L. Dollings Co., of Columbus, Ohio. The concern manufactures a direct-drive truck. Colonel Potter was formerly with the Kilbourn & Jacobs Mfg. Co., Columbus, Ohio.

place west of the city is Thatcher's Grove, on the Des Plaines river in the suburb of River Forest. Thatcher avenue bounds it on the east and the main entrance, with a surfaced drive leading into a parking place, is opposite the end of Chicago avenue. Motorists can drive west on Washington boulevard through Oak Park into River Forest. Where Washington boulevard stops, turn north about a block; then west on the street marked Randolph in one place and Washington boulevard further west, going north again on Thatcher avenue to Chicago avenue. In this preserve are two comfort stations, two drinking fountains and a large, clean, grassy playground bordered by magnificent trees and native shrubs.

Following paved Western avenue south, a way black with motor cars on Sundays, opens up Beverly Hills, a small, level, open grove at the top of a small hill and on the east side of Western avenue. This was an old Indian look-out and signal point. Continuing south to Chicago Heights, other tracts are discovered immediately west of that town. Along Salt Creek, several spots

the Des Plaines river, west through Maywood and Melrose Park into the open country. Where the Fifth avenue road turns south, rising immediately into a long viaduct across railway freight yards, turn south, following Fifth avenue south through LaGrange until it ends at right angles to the Willow Springs road, thence to Willow Springs, thence down Archer avenue to the southwest, past Fairmount cemetery, to a tiny frame box on the left hand, marked Maple Hill waiting station. Here leave the pavement and climb a stiff hill road, of natural surface, for about ¼ mile, where you enter the preserve.

Alternative routes are to go west from the south side on Twelfth street to Fifth avenue road, thence south; or to follow Washington boulevard to its end in River Forest, jog south to Madison street, thence west to Des Plaines avenue, then south through Riverside, crossing the river east of Lyons and continuing west to pick up the Fifth avenue road on the extension of Forty-seventh street just south of LaGrange.

From the Four Winds



EVERY SCOUT TO FEED A SOLDIER—The Boy Scouts of Oklahoma City, Okla., have undertaken to cultivate 15 acres. Here they are working with a 10-20 hp. Case tractor under the supervision of C. R. Donart, county farm agent

WORK on Monroe Road Held Up—Work which recently was started on the Monroe and Detroit road has been stopped pending the arrival of materials which are held up by an embargo on the Lake Shore.

Columbus Club Erects Road Signs—The Columbus Automobile Club has erected more than 100 direction signs on the highways in the neighborhood of the Buckeye capital. It is the plan of the club officials to post signs on all of the roads within a radius of 50 miles of Columbus.

Boston Association to Give Outing—The Boston Automobile Dealers' Association will give its annual outing for the crippled and orphaned children in the different homes in and about Boston, Mass., June 5. It is planned to get some 700 cars for this purpose and take the children to Nantasket beach.

Teaches Owners Care of Ford—The Ford branch in Kansas City, Mo., offers every Tuesday evening free instructions in the care of a Ford to all Ford owners in the city. Five hundred attended the first class. A chassis on a raised platform is provided, and the functions of the various parts are explained.

Ford Plant Reduces Accidents—The Ford Motor Co. has made a reduction in its lost-time accidents of 74.2 per cent in the last eighteen months. During the twenty-six working days in April there were but forty-six lost-time accidents. This means that the average number of accidents per 1000 employees was 1.4, and the number of minutes lost, if distributed over the entire working force, would equal 7.3 min. per employee for the month. Eleven months elapsed at the plant without a fatal accident. There was one death from accident in April.

O-L-D Road Boosters Meet—Stimulus in road-building was gained at the annual meeting of the Omaha-Lincoln-Denver Good Roads Association, when about 100 representatives of cities along the line of the O-L-D highway in Nebraska attended. This organization has been very active in the promotion of good roads, particularly in the southern and western sections of Nebraska, where roads have been in the past notoriously bad. The labors of the workers have borne fruit in extensive plans for road-building and improvement during the coming year. Paving is already far along in the county of Lancaster, which in-

cludes Lincoln, the state capital. It is estimated that by the end of the summer 85 per cent of the principal roads in the county will be paved.

Dates for Texas Show—The seventh annual Texas motor show will be held at Dallas, Tex., this year Oct. 14-27. The show will be four days shorter than last year. Dealers who expect to exhibit will meet soon to plan for the exposition. The closed car salon which has been a spring feature at Dallas will not be held this year.

Car as Outdoor Pulpit—The trend for motor transportation is exemplified in the use of a Cadillac car by David Goldstein, a representative of the Catholic Truth Guild of Boston, engaged in mission work. The forward part of the body is arranged so the top can be adjusted to form a sounding board for the speaker, who talks out in the open.

Goodyear Gives \$550,000 to Aid War—The Goodyear Tire & Rubber Co. announces a total subscription of \$550,000, contributed by more than 18,000 employees, during the several campaigns for funds for the various war activities. This contribution constitutes almost 25 per cent of the entire amount obtained in the Akron campaign. Approximately 4000 Goodyear workmen already have gone to training camps and to France.

Truck Record Los Angeles-to-Oakland—As a notable demonstration of the practicability of motor trucks for freighting, a Moreland 2½-ton distillate-burning motor truck, loaded with 5100 lb. of Standard Oil products, recently completed the run from Los Angeles to Oakland, a distance of 456 miles, in exactly 18 hr., 26 min. This, with an average of about 24.7 m.p.h., breaks all previous records for a loaded truck for the same trip by 5 hr., 23 min.

Soldiers and Sailors to Ride Free—Transportation will not be lacking for uniformed men in New York City if the mayor's committee on national defense succeeds in its plan launched recently for the organization of the give-the-uniformed-man-a-lift-fraternity among car owners. Cards will be stuck on windshields and constitute sufficient invitation for enlisted men to ride in these cars.

Automobile Club of Arizona—The Automobile Club of Arizona has organized to encourage uniformity of traffic regulations and en-

deavor to unite for co-operative purposes the car owners of Arizona. Tours to points of historic interest will be compiled by the club and the weekly report on the condition of highways will be issued. It is hoped to have a membership of about 1,000 before the close of the year.

Motor Truck Line Aiding Freight—An outlet for freight congestion between Memphis, Tenn., and Victoria, Miss., has been supplied by the Memphis Motor Transportation Co., whose trucks are conveying freight to and from these points. This transportation company sends trucks daily to and from Memphis and Victoria. The route from Memphis to the Mississippi terminal of the line runs through Oakland, Capleville, Mineral Wells, Olive Branch, Miller, Byhalia and Victoria.

Oklahoma to Coast in Less Than Nine Days—Starting from Lawton, Okla., H. A. Loyd and a companion, Frank Jones, reached Los Angeles in completion of a motor trip of 1627 miles. The trip was made in Mr. Loyd's Velle six, and was consummated in but eight and a half days. They traveled the historic old Santa Fe trail the greater part of the way, which between Springville and Holbrook, Ariz., reaches an altitude of 8700 ft. Prior to starting on the journey to the coast Mr. Loyd had driven the car only 26 miles.

N. A. D. A. Endorses Anti-Theft Law—The N. A. D. A. has endorsed the anti-theft law drafted by J. T. Botkin, state secretary of Kansas, acting as a committee for the American Association of Secretaries of State, and pledged its support in endeavors to get this bill passed by the various states. This law requires that whenever a motor vehicle is sold the sale shall not be legal until the seller transfers a certificate of title and license, issued by a secretary of state. Also it makes the requirements for licensing all cars the same in all states except as to fee. The N. A. D. A. directors also endorsed several proposed bills to protect cars in driveways.

Would Have Stone-Picking Day—Stone-picking day has been suggested by the Aurora, Ill., Automobile Club. Governor Lowden has been asked to select such a day, and, by public proclamation, ask every person in the state to tour the roads in the vicinity of his home and remove all stones that may interfere with the progress of vehicles or damage tires. All organizations of good roads and motoring are urged to get behind the movement and endeavor to get as many volunteers as possible. The Boy Scouts of each city also will be invited to assist. The Aurora club inaugurated stone-picking day May 18, when all stones were removed from the immediate Lincoln highway.

Fight Removal of Curb Stations—The proposed Detroit city ordinance ordering the removal of gasoline filling stations and air service pumps from Woodward avenue was defeated by opposition of the garage men and accessory store proprietors who circulated a petition of protest among their patrons and motor car owners. At a meeting in the board of commerce rooms W. T. Wilson, chairman, declared that to remove his sidewalk equipment, which was installed at a cost of several thousand dollars, would cost more than the equipment would be worth. He also stated that the enforcement of the proposed ordinance would mean the commercial ruin of many garage men and accessory dealers.

Ship it by MOTOR TRUCK



With staggering demands upon transportation facilities, it is the duty of every shipper to relieve the railroads of everything that can be handled in any other way. Leave the railroads open just as far as possible for transportation of war supplies and for those shipments that only the railroads can handle.

If you have shipments for points that can be reached by the highway, ship by motor truck.

If there is a highway freight transportation system already at your service, use it for everything possible.

If you do not have such a system, co-operate with other shippers to establish such systems as may be necessary to serve your community.

Highway freight transportation is practical in every way, it will give you a fast, reliable freight service and you will find it a profitable field for investment.

In the selection of motor trucks for highway freight service or any other purpose, be sure to choose a

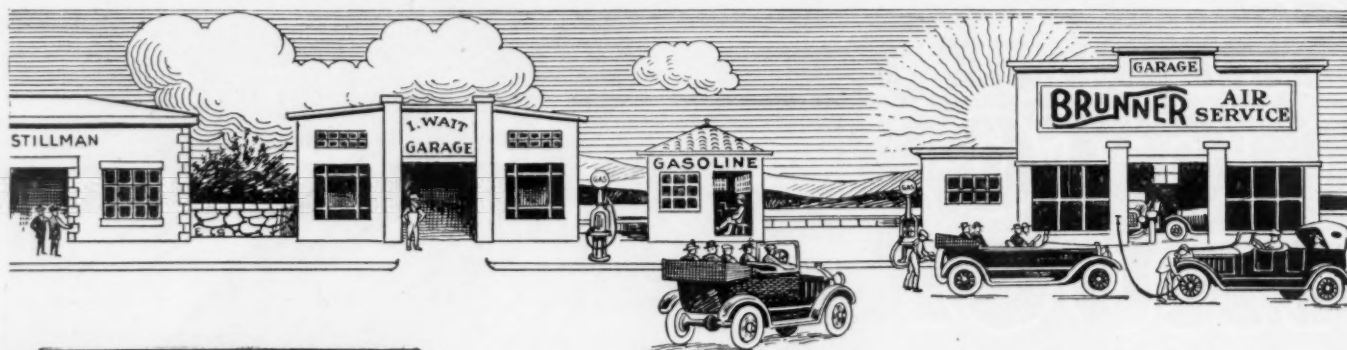
truck that is well built all the way through, but pay particular attention to the steering gear.

The steering gear is the only part of a truck in which the human strength of the driver is concerned. A steering gear that is easy to operate conserves this strength and increases the efficiency of both driver and truck.

The enormous bearing surfaces in Ross Steering Gears, together with Ross quality in materials and workmanship, guarantee safety, reliability and easy operation. It naturally follows that a Ross-steered truck means a bigger and an easier day's work for the driver and indirectly through him, greater service from the truck he drives.

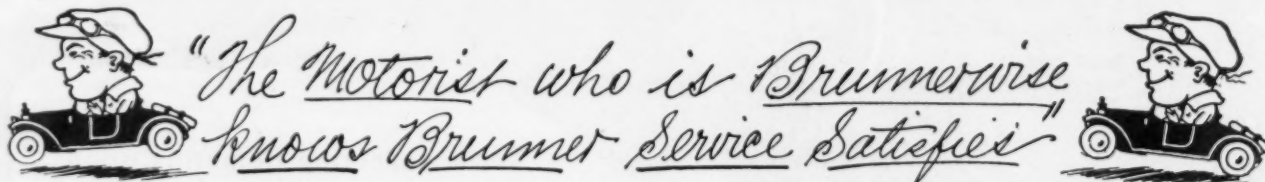
Write for catalog and further information about "The Steering Gears that Predominate on Motor Trucks". Ross Steering Gears are now used by 115 different manufacturers, representing considerably over half the motor truck industry in America.

ROSS GEAR & TOOL COMPANY
400 Heath Street Lafayette, Indiana



Mr. Garageman, if you have a Brunner Air Compressor in your garage and are not displaying a Brunner Sign on your garage advertising the fact that you are rendering Brunner Service, you should send for a Brunner Sign without delay.

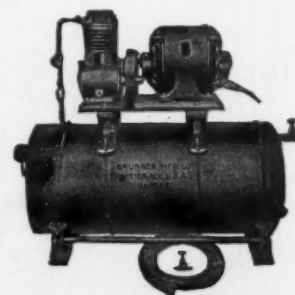
ADVERTISE YOUR BRUNNER SERVICE AND SECURE YOUR FULL MEASURE OF THE BRUNNERWISE MOTORISTS' PATRONAGE



Thousands of garagemen have been advertising Brunner Service by means of the Brunner Sign for many years and Brunner Service has consistently demonstrated its absolute dependability to thousands of motorists for many years, so that these Brunnerwise Motorists now recognize the Brunner Sign as a sure sign of absolutely dependable service wherever they see it.

In this way the great advertising value of the Brunner Sign has been convincingly demonstrated to the garageman in actual service for many years, and the thorough dependability of Brunner Service has likewise been demonstrated to the motorist.

NO GARAGEMAN WITHOUT A BRUNNER AIR COMPRESSOR CAN AFFORD TO OVERLOOK THIS SPLENDID OPPORTUNITY OF SECURING THE PATRONAGE OF THE BRUNNERWISE MOTORIST — A BRUNNER AIR COMPRESSOR WILL DO IT.



WHEN YOU BUY A **BRUNNER** AIR COMPRESSOR

You buy a high grade, practical compressor designed and developed for the garageman's use in the largest and best equipped exclusive garage air compressor plant in the world, and backed by a responsible organization whose entire time and attention has always been exclusively devoted to the garageman's interests. No attachments necessary to help the motor to start against full load. No cages necessary to keep the valves from falling into the cylinder. No restriction of lubrication to invite trouble and no claims of impossible performances, but—simply the same good substantial business proposition it has always been for the garageman.

Write for No. 15 Catalogue and Name of Brunner Jobber Covering Your Town

BRUNNER MANUFACTURING COMPANY

General Offices and Plant
UTICA, N. Y.

Cincinnati Branch
CINCINNATI, OHIO

STEPHENS

Salient Six

† † Energy † †

WITH the energy of a waterfall, the Stephens engine is as smooth flowing in its mighty power. Perfect balance and complete fuel combustion compass this achievement. Perfect balance is created by infinitely careful machining-to-equal-weight of the reciprocating parts.

Complete combustion is due to a superior gas-handling system—a hot spot to super-heat the gases, intake manifold surrounded by heat and unusually large valves being contributing factors in the assembly of this perfected overhead-valve-engine which burns ALL the gasoline.

FIVE MODELS

Three-Passenger Roadster
Four-Passenger Touring
Five-Passenger Touring
Five-Passenger Victoria
Five-Passenger Touring Sedan

Stephens Motor Branch
of Moline Plow Co., Moline, Illinois

Factory: Freeport, Illinois

DEALERS: There is a Stephens Model for every use. Stephens representation gives you self-selling cars to cover a large field of users.



STRETCHES WITH THE TUBE



Perm A. Tite
He Sticks
'em Tight

Sticks In Hot Weather

Here is a patch for tube repairs that gives perfect satisfaction under all conditions. It has a rubber back and stretches with tube. Will not pull loose or develop leaks in hot weather.



IS A PERMANENT REPAIR

When you repair a tube with Perma-Tite it is permanent, not a temporary repair to last until you get home or to the shop. It becomes a part of the tube itself, saves you expense and repair bills.

PUT ON IN A MINUTE

It takes only a minute to put on the Perma-Tite Patch. No tools required.

Slip the tube back into the casing, pump 'er up, and you're off.

The finest and purest materials are selected for Perma-Tite. The rubber is cured by a slow, special process which cures it absolutely uniformly. This insures that the patch will vulcanize perfectly at every point. The Perma-Tite Patch virtually makes a new part in the tube, a live, stretching part.

The Perma-Tite Self-Vulcanizing Rubber Back Patch is made in sheets of convenient size so that just the right size patch can be cut for the needed repair. Packed in cans in three sizes:

Small Size, 4" x 10", \$.50

Medium Size, 5" x 17", \$1.00

Large Size, 5" x 27", \$1.50

If your dealer doesn't have it in stock, it will be sent prepaid upon receipt of price. Satisfaction guaranteed or money refunded.

Perma-Tite Manufacturing Company

Manufacturers of Original Perma-Tite Fabric-Back Patch. Same Prices As the Rubber Back Patch.

65 N. E. Fifth St.

Minneapolis, Minnesota



Dealers Will Quickly
Recognize the Sales
Possibilities of This
1½-Ton Truck
In Its
Specifications



TRIANGLE TRUCKS

Motor "Waukesha" Model B. Unit Power Plant Type, three point suspension, 4 cylinders, 3¼"-bore, 5¼"-stroke, developing 35 H. P. at 1,350 R. P. M.

Ignition "Eisemann" High-tension Magneto.

Carburetor "Stromberg."

Cooling System. Capacity, 7 Gallons. Circulation is by means of centrifugal pump on motor through "Perfex" Radiator, so constructed that freezing will not injure the tubes.

Gasoline Tank. Capacity, 17 gallons. Carried in Cowl.

Transmission "Fuller" Unit Power Plant Type, center control, selective sliding gear, 3 speeds forward, and reverse, bolted direct to flywheel housing. All gears ⅞"-face nickel steel. "Fuller" Multiple Disc Dry Plate Clutch.

Drive Shaft "Universal," equipped with three ball-bearing universal joints. Center of shaft is supported by an S. K. F. Self-aligning Ball-Bearing, which makes whipping of shaft impossible.

Rear Axle. "Celfor" Internal Gear Drive Ratio, 7 to 1. Equipped with M. & S. Locking Differential, insuring positive drive on both wheels at all times. Load Carrying Member is a solid bar of Nickel Steel, 2⅝" in diameter. Nos. 307 and 310. Bower and Hyatt Roller Bearings.

Front Axle. "Torbenson," one-piece Drop Forging. I-Beam Section 2"x2⅝". Bearings. Nos. 310 and 335 Bock Taper Rollers.

Springs. "Detroit." Bronze-Bushed Eyes. Front 2¼"x42¾"; rear 2½"x54". Spring Bolts Nickel Steel; spring bolts hardened and ground, and equipped with oilers.

Brakes. Emergency, 16"-diameter by 2"-face, external contracting on Rear Wheels. Service, 10"-diameter by 4"-face, external contracting, located on drive shaft at rear of S. K. F. intermediate Ball Bearing.

Steering Gear, "Gemmer," Irreversible.

Turning Radius, 23 feet 6 inches.

Wheel Base, 144 inches.

Tread, 56 inches.

Wheels. Wood artillery type having 14-2" square spoke.

Road Clearance, Front, 9½ inches, rear, 12¼ inches.

Frame. Built up from 6-inch, 8-pound Rolled Channel Steel, heavily braced with Cross-members and Gussets. Over all length, 215 inches.

Chassis. Equipped with running boards, fenders and seat.

Loading Space. Distance, seat back, to rear axle center, 77⅞ inches. Seat back to rear end of frame, 126 inches. Width of frame back seat, 34 inches.

Accessories. Tool Kit, Jack, Horn, Hubodometer, Adams-Westlake Oil Lamps, and License Brackets.

**Immediate deliveries on 1½-ton model
Deliveries October 1st on 2½-ton model**

Wire or write for full particulars and unusually interesting dealers' proposition

TRIANGLE MOTOR TRUCK CO.
ST. JOHNS, MICHIGAN, U. S. A.

When Writing to Advertisers, Please Mention Motor Age



Porcelain-ware

Inferior insulators, like cheap porcelain-ware cups, break under sudden changes of temperature



Stone-ware

Stone-ware withstands extremes of heat and cold. That is why Vitristone insulators do not break

Dealers are cashing in on Red Head plugs

Why the story of Vitristone is proving a powerful sales builder

MOTORISTS used to buy spark plugs carelessly. Many still do.

But thousands are learning every day that plugs with inferior insulators cannot stand up under the severe operating conditions of the modern engine.

That is why Red Head dealers are cashing in so heavily on the increasing demand built up by the interest of motorists in the story of Vitristone—the insulator that withstands heat and vibration.



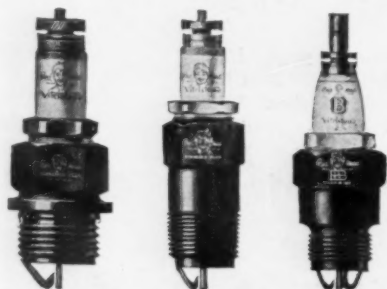
Chalky, inferior insulators break down under heat. Rugged, crystalline Vitristone withstands the severest conditions

This story is told in Red Head advertising in the Saturday Evening Post, Country Gentleman and nineteen other publications, reaching more than 20,000,000 readers.

In every state, thousands of motorists, convinced by the sincerity and common sense of the Vitristone message, are buying Red Head plugs.

Jobbers and dealers who are prepared to meet this enormous demand are making quick and profitable turnovers.

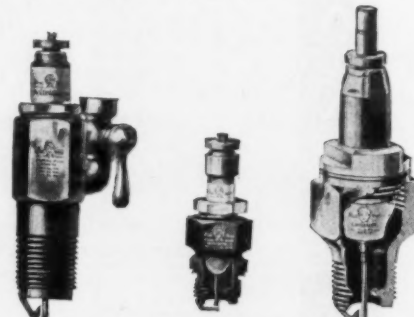
Write today for complete details.



Red Head Vitristone $\frac{3}{4}$ "-18 Standard. An all-purpose plug, \$1.00. Red Head Vitristone Long Body Special for Fords. Very accessible. 75c. Red Head Vitristone $\frac{3}{4}$ "-18 Big Boy. For high-powered engines, \$1.25.

EMIL GROSSMAN M'F'G CORP'N
Bush Terminal, Bldg. 20, Brooklyn, N. Y.

Red Head  *Spark Plug*
Vitristone Insulator



Red Head Vitristone Priming $\frac{1}{2}$ " Long Body accessible type for Fords, \$1.50. Red Head Vitristone Motor-cycle metric plug. Protected from carbon, \$1.00. Red Head Truck and Tractor plug. Mica protected by Vitristone, \$1.50.

When Writing to Advertisers, Please Mention Motor Age

**5000
MILES**

THE MIGHTY AMAZON

The "U" in Supertires

YOU as an Amazon Dealer are a vital part of our organization. YOU are, in fact, the "Sales Department" and we the "Manufacturing Department."

For all Amazon Products are sold to the consumer thru YOU, and if we stopped our merchandising activities after only YOU have been sold, we would never secure that mighty power in merchandising, voluntary repeat business!

"And we cannot secure this voluntary repeat business from YOU unless YOU in turn secure it from YOUR customers!"

Our work then is to advertise Amazon Products to the consumer in YOUR territory, and to advertise over YOUR name, as YOU are the man from whom these products MUST be purchased—as there can be no other Amazon dealer in YOUR territory.

Immediately then, that YOU lay in a stock we get behind YOU with all the combined power of our sales and advertising departments, and give YOU a "flying start" in YOUR territory! And all of this advertising co-operation we furnish to you FREE OF CHARGE, feeling, as we said, that you are virtually our sales department and should not be asked to stand even a portion of the expense.

Let us explain our proposition to YOU in full.

THE AMAZON RUBBER COMPANY
AKRON OHIO
NEW YORK BRANCH
218 AMSTERDAM AVE

SERVICE

“FOR over eight years we have used New Departure Ball Bearings in this transmission — with very good satisfaction; the reason why we insist on New Departures,”

says the chief engineer of a foremost four wheel drive truck manufacturer.

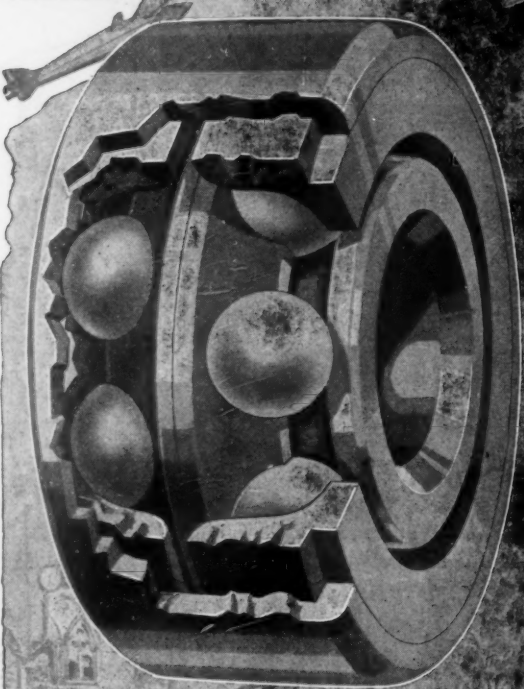
Only consistent service breeds loyalty.

Only the finest bearing material—chrome alloy steel, superior processes and exquisite precision, such as you find in New Departures, gives this consistent service.

THE NEW DEPARTURE MANUFACTURING COMPANY,
Bristol, Conn. 311 Detroit, Mich.

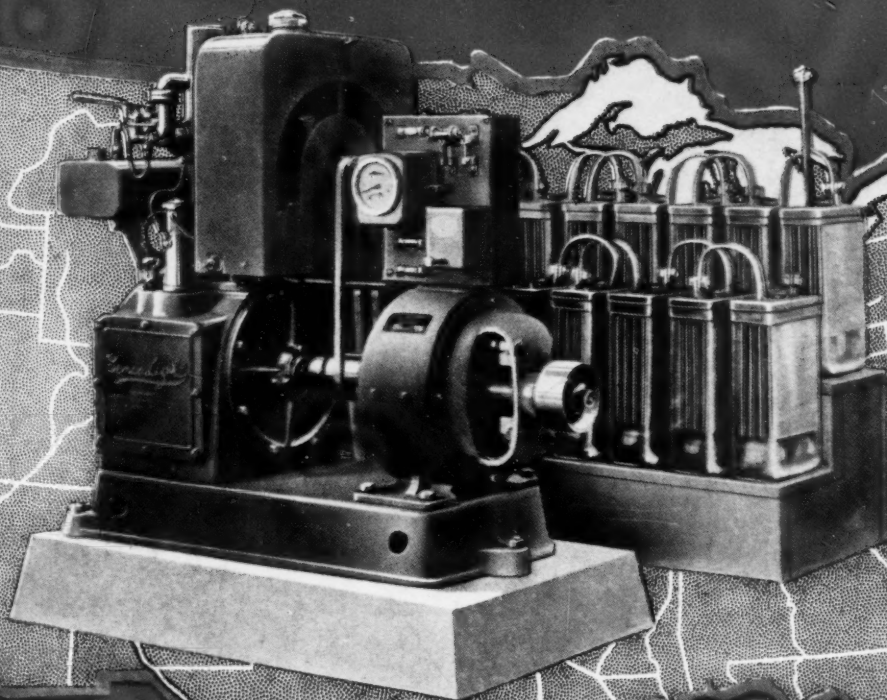
Conrad Patent License.

New Departure Ball Bearings



When Writing to Advertisers, Please Mention Motor Age

We Want Dealers in Many Sections



Here's What You'll Have to Sell

Engine: High grade, vertical, 4-cyle, valve-in-head, counterbalanced crank, internal fly-wheel.

Carburetor: Burns kerosene, gasoline or alcohol. Adjustable handle for easy starting and for different fuels. Fuel tank holds one gallon and is connected to carburetor with copper pipe.

Ignition: Special 32 volt type distributor and coil.

Lubrication: Improved splash system of patented design. Oil gauge on crank case indicates oil level.

Cooling System: Cellular radiator, bolted to cylinder of engine; special adjustment to suit weather conditions.

Generator: Our own design specially constructed in our own factory. Gives high efficiency under rated load. Armature shaft supported by annular ball bearings.

Control Board: Bolted integral with generator; equipped with ampere hour-meter—bi-pole switch connects battery to plant. 2, 30 ampere fuses on house circuit, 5 ampere fuses on ignition circuit. All wiring at the rear completely enclosed and protected.

Starting Switch: Outfit is started by pressing button on control board. Special cutout stops engine automatically when battery is fully charged.

Battery: Our own special make, 16 sealed top glass jars—plates extra thick, insuring long life. Cells shipped fully charged.

Mechanical Power: Engine provided with pulley for driving machinery or line shaft direct. Engine delivers 2 H. P. for such work.

Are you going to be in on the big profits that dealers throughout the country will make on the sale of the

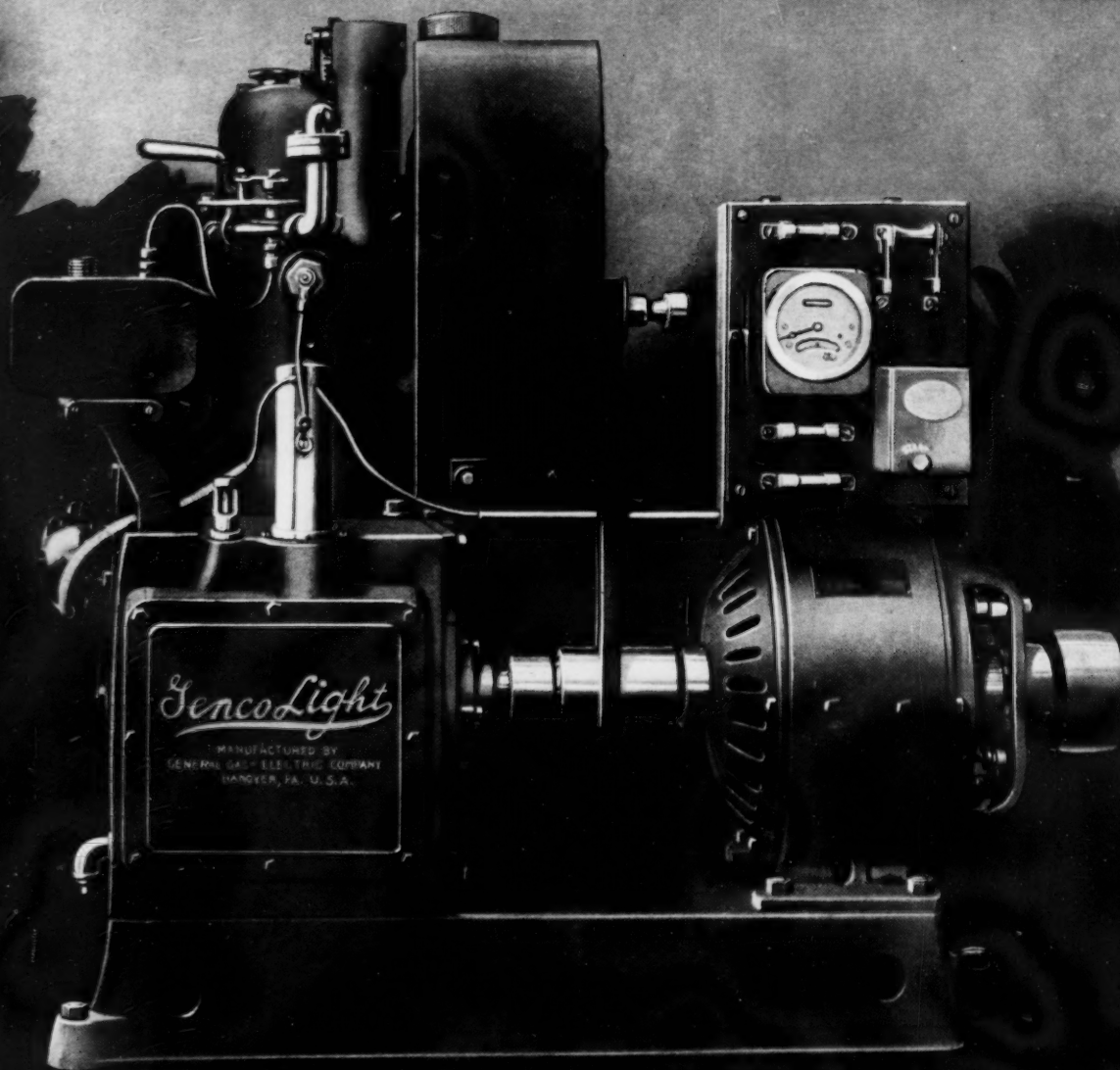
Genco Light

the peer of individual light plants for farm use? The Genco Light offers possibilities big enough to appeal to men who are accustomed to doing things in a big way. Write us today for details of our dealer's proposition.

The General Gas Electric Company
E. Sixth and York Streets
Hanover, Pa.



WRITE TODAY FOR DEALER TERMS



Genco Light

The demand for Genco Light outfits has been greater than we could meet, but now with our greatly increased facilities for production we will be able to extend our sales policy and take care of a larger distributor and dealer representation.

The Genco Light offers wonderful opportunities in unoccupied territory. We want live salesmen because we are going to make the Genco Light the biggest sales factor yet developed in the electrical and motor industry fields.

Our proposition for distributors is of such a nature that it will be attractive to all firms sufficiently well financed to enable them to cover territory in the big way that the profits on this proposition will justify. Write us today for further particulars.

The General Gas Electric Company

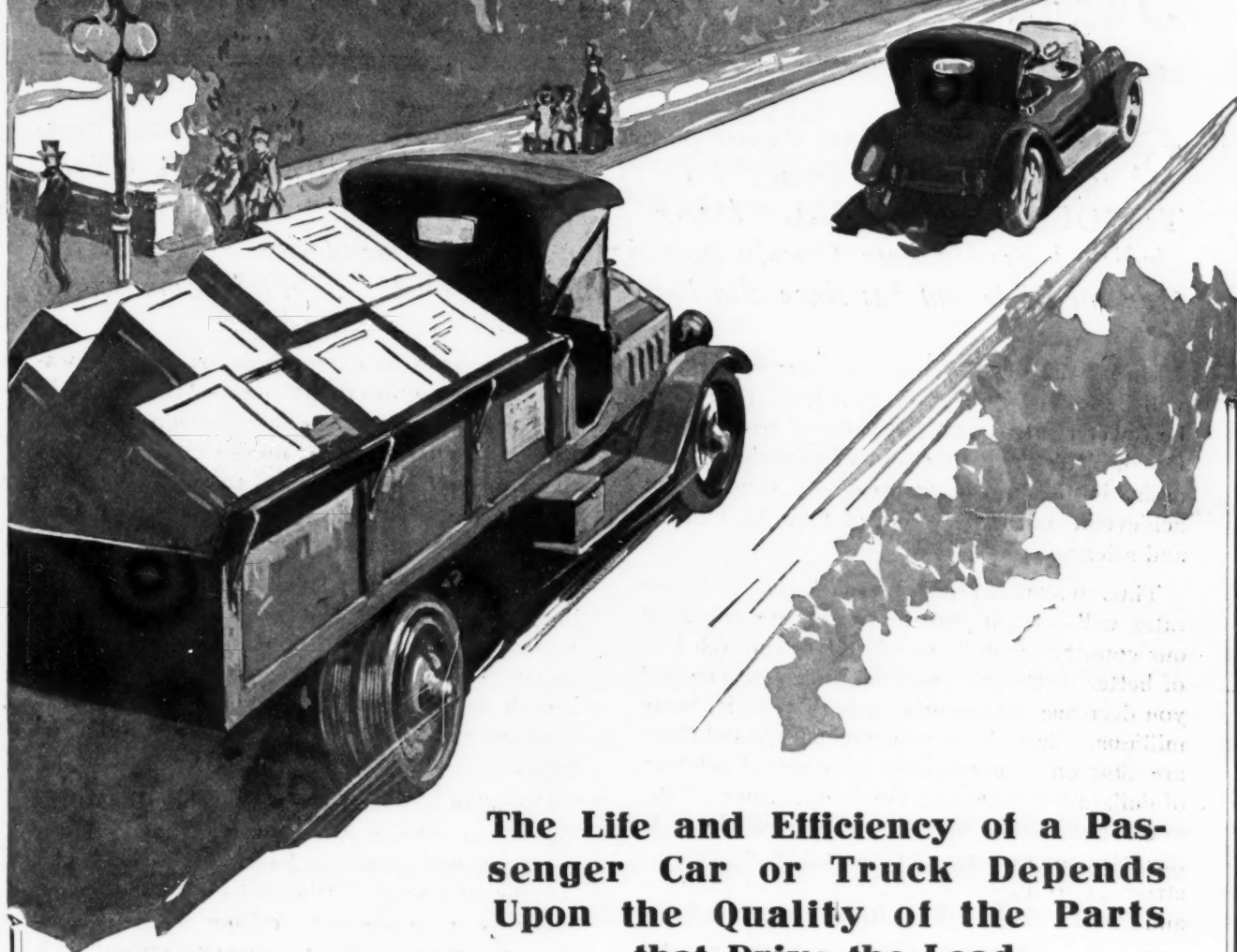
E. Sixth and York Streets

Hanover, Pa.



BROWN-LIPE-CHAPIN

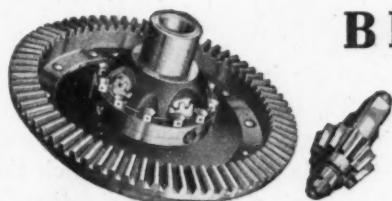
DIFFERENTIALS



The Life and Efficiency of a Passenger Car or Truck Depends Upon the Quality of the Parts that Drive the Load

The terrific strain of present-day service is borne by two accurately meshed gears, housed in the rear axle. Our time-tried methods of manufacturing bevel gears enable them to deliver maximum power quietly—smoothly.

Particulars about the quality of Brown-Lipe-Chapin Differentials furnished to owners, dealers and manufacturers of passenger cars, motor trucks and tractors.



Bevel-Drive Differential for 1-Ton Trucks, as used by General Motors Truck Co.

BROWN-LIPE-CHAPIN CO.

DIFFERENTIALS

Syracuse, N. Y.

Representatives

San Francisco: A. H. Coates, 41 Speare Street

Foreign Agent: Benjamin Whittaker, 2 Norfolk Street, Strand, London, W. C.

When Writing to Advertisers, Please Mention Motor Age

Strangling the Periodicals

CONGRESS at its last session passed a hasty postal law increasing the postage on periodicals from FIFTY TO NINE HUNDRED PER CENT THROUGH A POSTAL "ZONE" LAW. *The postal "zone" system was abolished by Abraham Lincoln in 1863 on the recommendation of Postmaster General Blair and has since also been condemned by U.S. Postal Commissions.*

Under the postal zone law some periodicals will be killed—all will be crippled. There will be fewer readers, and the habit of reading curtailed. The great functions of periodicals is to assist in the spread of ideas—by printing the achievements in the world of thought, culture, and science.

Thus to shut out farm journals—as these zone rates will—will lessen the productive power of our country by millions of dollars through loss of better methods. Shut off trade journals and you decrease the manufacturing power by more millions. Shut off the religious papers and there are shut off channels that have raised millions of dollars for distressed humanity. Shut off the great periodicals of the home and there is throttled an avenue that has given expert instruction to hundreds of thousands of mothers and saved their babies to health and citizenship.

These national periodicals are printed in the big cities—and the first zone, the cheapest zone,

is in or near those cities; there are many educational opportunities near cities, and the cities will read anyway. Small towns and distant districts depend to a large extent upon periodicals; thus this law increasing periodical postage where it is most needed shuts off opportunity where needed. It penalizes periodical readers.

Congressman Claude Kitchin of North Carolina, who fathered it and compelled its adoption, refusing hearings on the measure,—it had been twice defeated by the Senate—stated in his speech in Congress that it was **not** a War Revenue amendment but **permanent postal legislation**.

Canadian magazine readers, even to the Arctic Circle, can receive American magazines at four cents a pound postage. Every American reader—if they live west of Missouri—**must pay almost twice as much postage, or from 4½ to 8 cents postage per pound for the same magazines!** This is what the postal "zone" law means—discrimination against American citizens of all Western States. Do you live West of Missouri—of Minnesota, Iowa, Arkansas or Louisiana? Then this postal "zone" law discriminates against you and in favor of every Canadian reader to the shores of the Pacific and North to the Arctic Circle!

Will you help—Sign NOW.

It is not a War Tax. It is postal legislation, pure and simple.

Repeal this law. Repeal this FIFTY TO NINE HUNDRED PER CENT periodical postage increase with its unfair, iniquitous and disastrous "zone" system. Sign the petition below and mail it. Put a cross mark in the square—save the periodicals and the work which they have done and are doing for national education and patriotism.

PETITION TO CONGRESS—Sign Here!

The spread of education, of culture, of scientific knowledge and advancement, and of our vast internal merchandising and manufacturing has been, and always is, vitally dependent upon the freest and cheapest circulation of periodicals. The penalties resulting from any restriction on the freest circulation of periodicals will be destructive of the best interests of our economic life and the opportunities of developing our best citizenship.

The postal amendment passed by the last Congress increasing the postage on periodicals from FIFTY TO NINE HUNDRED PER CENT with its postal "zone" system will throttle or destroy our periodicals at a time when the widest and most extensive circulation of publications is essential to the patriotism, education, and upbuilding of our country.

Therefore, I, the undersigned, do most earnestly demand the repeal of this burdensome periodical postage amendment.

Name

City or County.....

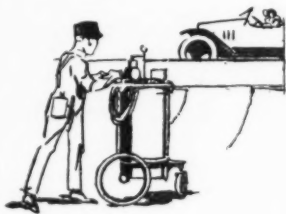
Street Address.....

State

Periodicals mean much in your life. If you will help by a few arguments with your acquaintances and an occasional letter to your Congressman in a spare moment, put a cross mark here.

☐ Will you help in securing the repeal of this iniquitous law? ☐

**CUT OUT, MAIL TO CHARLES JOHNSON POST
Room 1417, 200 FIFTH AVENUE, NEW YORK CITY**



LECTROFLATER

ELECTRIC AIR COMPRESSORS

You go to the motorist. Don't make him come to you. Fill his tires anywhere he happens to stop—that's service

MAKE your air service impressive—make it an advertising asset.

Be ready, rain or shine, in the garage, on the curb, in the street—anywhere—to give clean, pure air quickly.

With the Lectroflater Portable Tank and Pump outfit such a thing is both easy and economical.

The Lectroflater can be filled by simply attaching the electric cord connection (4) to a convenient electric light socket where it can remain when not in use.

It uses either alternating or direct current and you don't need to watch it for the Automatic Pressure Switch (2) starts the compressor refilling the tank when the pressure drops to 130 pounds and cuts out when 150 pounds pressure is reached. The large accurate gage (5) indicates the tank pressure at all times.

The Lectroflater is always ready with a load to fill ten average tires—fills them at a cost of 1/10 of a cent each in current and is guaranteed to pump only cool, clean, dry air.

The Pump itself is lubricated with grease—not oil (1) which means there's no oil level to maintain, and it's air cooled by forced draught so there's no liquid to freeze or evaporate.

All working parts are self-contained under one housing—there are no exposed belts or shafts or gears.

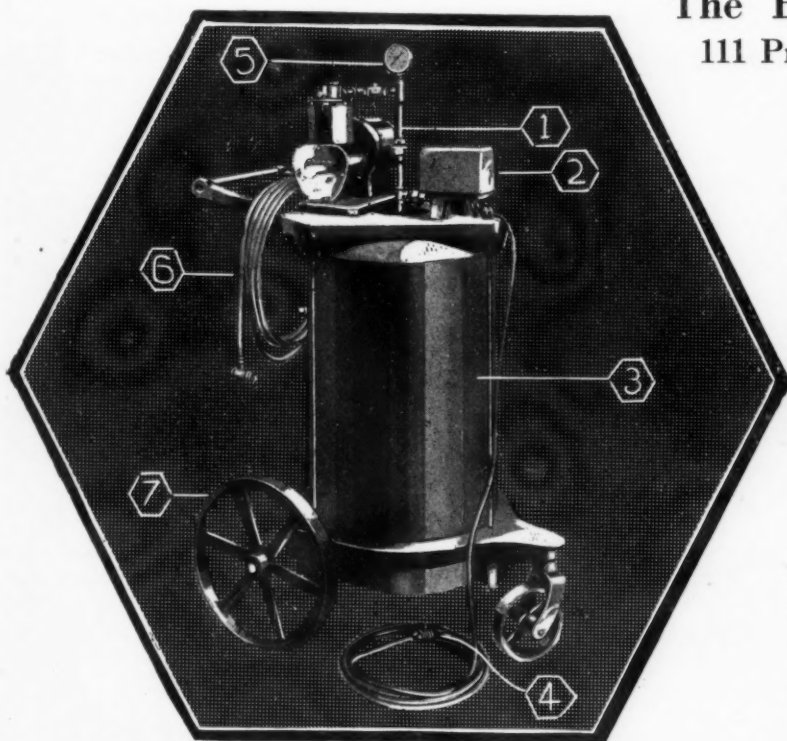
All working parts protected against dirt, grit, and rough handling. The tank (3) is welded and brazed in all seams and is tested to 300 pounds hydraulic pressure.

It's handsome—this Lectroflater Pump and Tank Outfit—the finish in green and black enamel with nickel trimmings. Large husky metal wheels (7) are furnished for hard service on cement floors or rubber tires for use on the hardwood or tiled floors of salesrooms or showrooms.

Twenty-five feet of high pressure hose (6) fitted with standard tire chuck—goes with each outfit.

Have the Lectroflater in your garage or salesroom.

Descriptive catalog of this and many other equipments at prices from \$65.00 up. Yours for the asking. Write for it.



Portable Tank and Pump Combination

The Black & Decker Mfg. Co.
111 Pratt St., Baltimore, Md., U. S. A.

JOBBER AND DEALERS

Motor Accessories Co., Allentown
Baltimore Electrical Supply Co., Baltimore
R. W. Norris & Co., Baltimore
Standard Electric & Elevator Co., Baltimore
Southern Electric Company, Baltimore
Moore, Handley Hardware Co., Birmingham
Edison Elect. Ill. Co., Boston
J. L. Gleason & Co., Boston
Wetmore Savage Co., Boston
Carlson Sales Co., Buffalo
Cambridge Electric Co., Cambridge
Carolina Auto Supply House, Charlotte
Ko-Mo Supply Co., Charlotte
C. D. Franke & Co., Charleston
Domestic Engineering Co., Dayton
Patterson Tool & Supply Co., Dayton
Smith Perry Electric Co., Dallas
Herring Motor Co., Des Moines
Automobile Equipment Co., Detroit
D. W. Alderman, Jr., Florence
E. Mather Co., Harrisburg
Swank Hardware Co., Johnston
Peake Automobile Supply Co., Kansas City
Hogle & Stevens, Malone
Orgill Brothers, Memphis
Cass & Bonerand, Naco, Ariz.
E. Brass Auto Supply Co., New Brunswick
E. P. Brandt, New York
E. J. Edmonds, New York
A. J. Picard & Co., New York
W. W. Whaley & Co., Norfolk
Alexander-Seewald Co., Atlanta, Ga.
Master Sales Co., Omaha
Sunderland Machinery & Supply Co., Omaha

Geo. A. Myers & Co., Paterson
Auto Specialties Co., Philadelphia
George W. Nock Co., Philadelphia
Standard Supply & Equipment Co., Philadelphia
Frank H. Stewart Electric Co., Philadelphia
Automobile Accessories Co., Pittsburgh
Doubleday, Hill Electric Co., Pittsburgh
Joseph Woodwell & Co., Pittsburgh
Belcher & Loomis, Hardware Co., Providence
Waite Auto Supply Co., Providence
General Auto Supply Co., Reading
Benton & Bailey, Richmond
Ballou & Wright, Seattle
F. Bissell Co., Toledo
Standard Supply & Equipment Co., Trenton
Barber & Ross, Washington
Hamilton Hardware Co., Waterbury
Wm. E. Duff, York

LIST OF FOREIGN REPRESENTATIVES

R. A. Rothermel, London, England
Northern Electric Company, Montreal, Canada
Pluym-Ochs Company, Petrograd, Russia
Richardson, Orr & Company, Melbourne, Australia

BRANCH OFFICES

New York, 20 E. 42nd St., Room 419
Atlanta, 701 Healey Building
Philadelphia, 502 Widener Bldg.
Boston, 169 Massachusetts Ave.
Chicago, 1512 S. Michigan Ave.

This Number of MOTOR AGE

"The Motoring Authority of America"

is a sample of the many good things in store for MOTOR AGE readers.

The coming issues of MOTOR AGE will contain a fund of valuable information that will turn over many times your subscription investment of \$3.00.

You must realize the advantage of being a regular member of the big MOTOR AGE family. You get your copy every week and there's no danger of missing one.

In these strenuous days of conservation and economy, it behooves us all to keep the throttle on our source of information wide open. One single new idea or suggestion gotten from MOTOR AGE may mean the saving of the whole year's subscription cost.

Give particular attention to "The Reader's Clearing House," "The Motor Car Repairshop," "Motor Car Development" and "The Accessory Corner" sections of each issue of MOTOR AGE—and don't fail to act on the timely suggestions and advice given in its weekly maintenance articles. Careful and systematic reading of this kind keeps you advancing in your knowledge of motor cars—keeps you abreast of the times and helps you economize wisely.

If you are not realizing the advantages of being a regular member of the MOTOR AGE family, let it be your counselor and guide hereafter—don't wait any longer to join—do so right now by using the application blank herewith:

MOTOR AGE

MALLERS BLDG., CHICAGO, ILL.

Date,, 1918

Published weekly from Chicago—
central location and frequent issue
mean you get the news quickly.

Gentlemen—

Enclosed is my \$3.00 for which { enter
continue } my membership in the Big MOTOR AGE Family.

Name

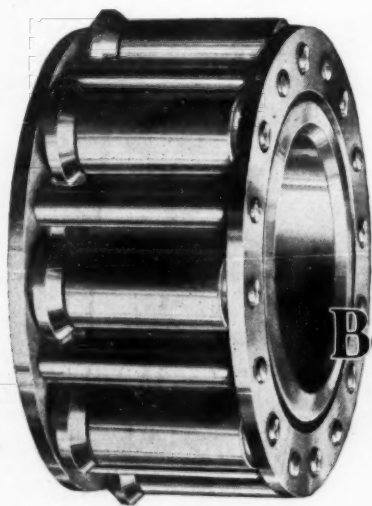
Address

United States and Its Possessions and
American Expeditionary Forces \$3.00

Canada \$5.00

Other Countries \$6.00

When Writing to Advertisers, Please Mention Motor Age



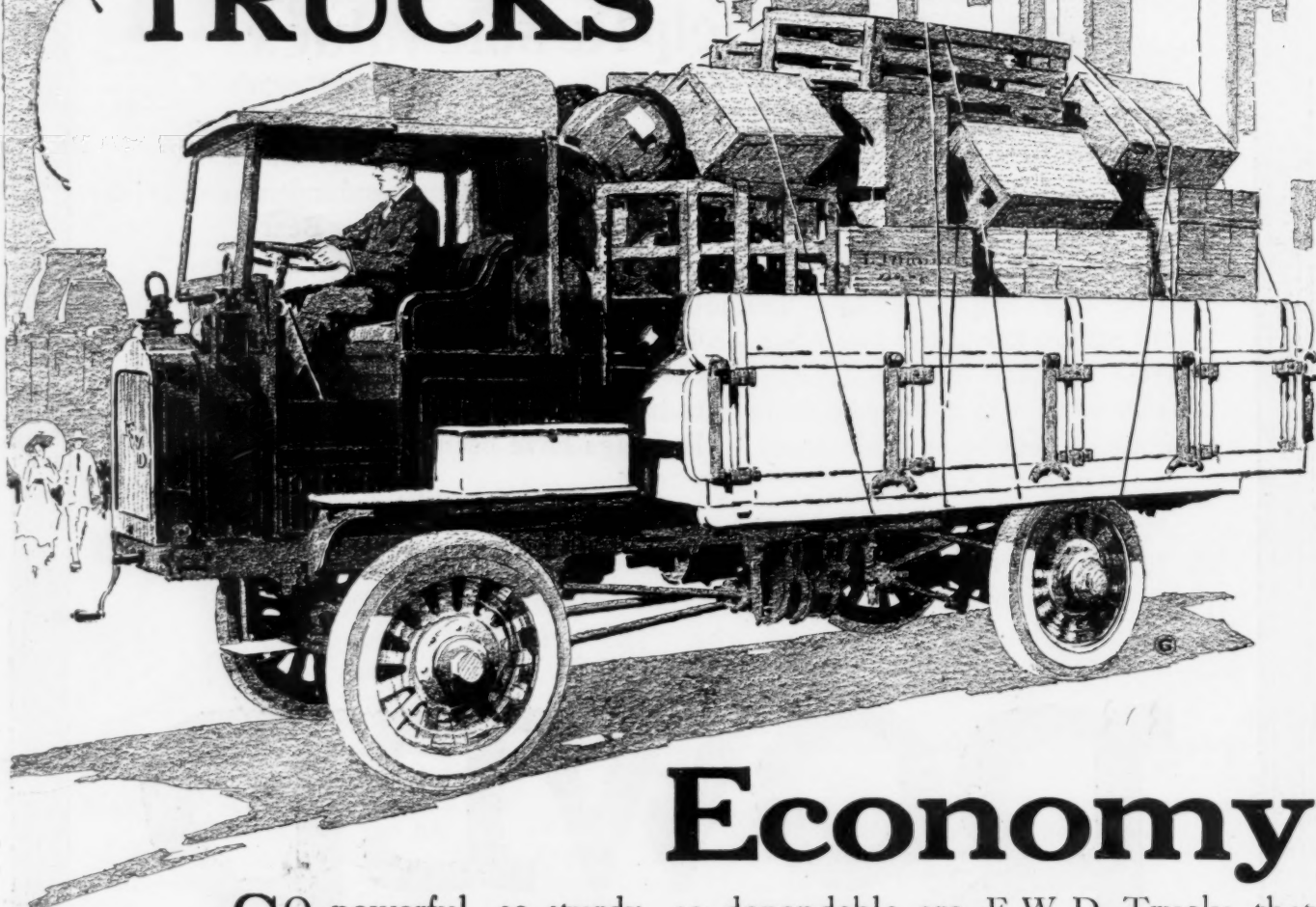
Bower Roller Bearings Help Re-sale Values

Those who pay careful attention to values find that cars and motor trucks equipped with Bower Bearings show less depreciation. The bearings are always found in good condition, and other parts of the car or motor truck are also likely to have suffered less when Bower Bearings have been used.

BOWER

ROLLER BEARING CO.
Detroit Michigan

FWD TRUCKS



Economy

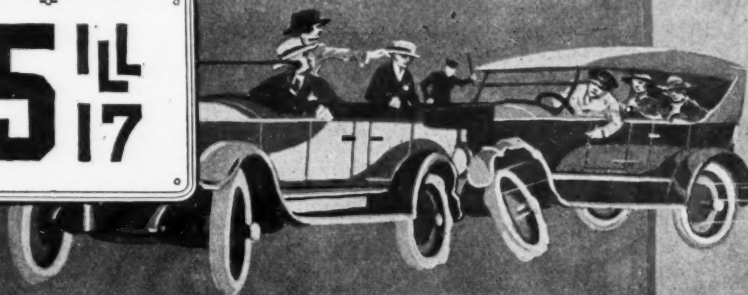
SO powerful, so sturdy, so dependable are F-W-D Trucks that their operating cost is extremely low—whether on paved city streets or rough country roads. This is due to the correct application of the four-wheel-drive principle—an exclusive feature of the F-W-D. Each wheel is a driving wheel.

FOUR WHEEL DRIVE AUTO CO.

Dept. L Clintonville, Wis.



PUT the BLAME
on the
MAN BEHIND



IS YOUR SIGNAL UNMISTAKABLE?
THE LAW SAYS: "SIGNAL THE MAN BEHIND"

The Comer Auto-Stop Signal Insures "Safety-First" Day and Night

A brand-new Warning Signal so unfailingly *Automatic* that it is bound to work, at the proper time, whether the driver knows of its presence or not. No push buttons—no levers—no switches—no complicated mechanism. Not electrically operated. Attaches to brake rod. Slightest pressure on service brake throws signal. Word Stop illuminated at night.

Price \$12.50

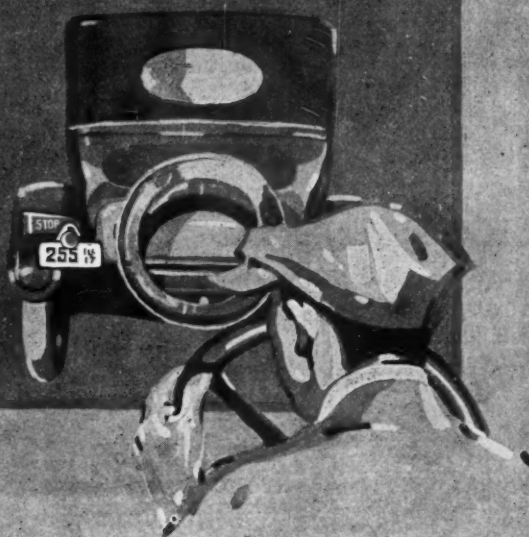
(F. O. B. Factory)

The Wonder Sales Co.

(DEPT 33)

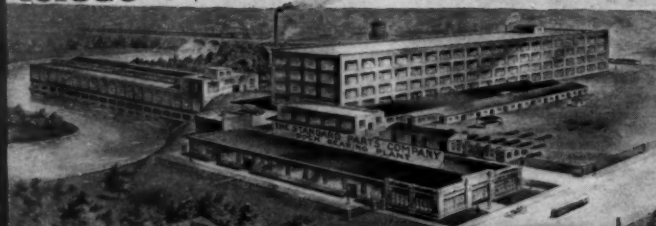
616-617 HIPPODROME BLDG.
CLEVELAND, OHIO

Note: When Ordering state Model and Year of Car

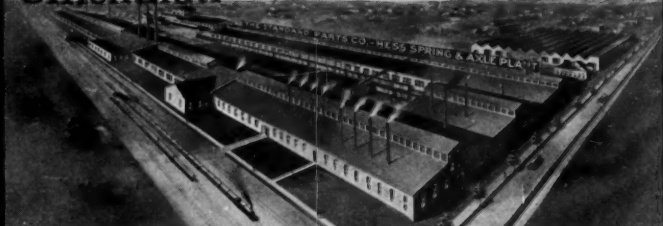




Toledo



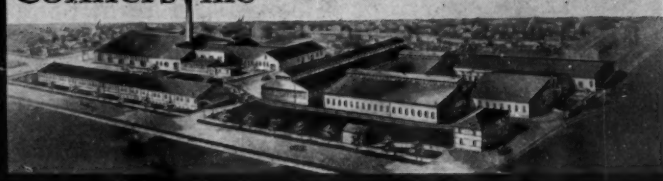
Cincinnati



Flint



Connersville



**Standard Parts for Motor Cars,
Trucks, Tractors, Airplanes, Motorcycles
and Other Vehicles**

Axles
Axles (dead rear)
Axles, trailer
Bock Bearings
Hubs

Perfection Springs
(regular and thin leaf)
Perfection Heaters
Stanweld Rims
and Tubing

A Dual

Our large and able staff of engineers is constantly serving the leading manufacturers of the automotive industries.

Here is an accumulation of special knowledge gained through extensive and varied experience, available for the solution of your problems.

Our staff is equipped and ready to render you practical engineering service.

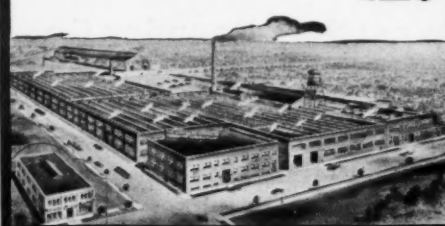
We also manufacture parts for Bicycles, Fire

The Standard Parts Company,

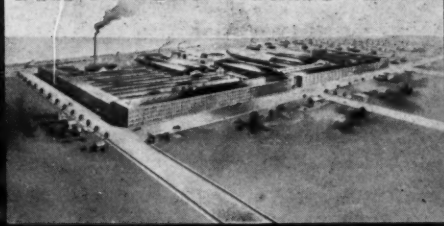
When Writing to Advertisers, Please Mention Motor Age



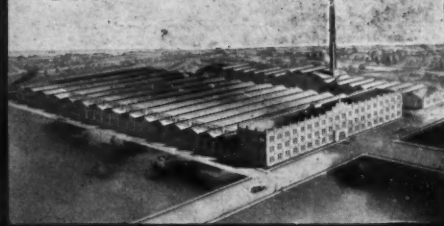
The Three Cleveland Factories



Pontiac



Canton



Wheeling



St. Louis

Service

Back of our engineers stand the resources and facilities of an extensive and intensive factory organization.

Strategically located factories, large manufacturing capacity, the economies of buying and manufacturing on a large scale are also yours to command.

May we help you plan — may we help you produce?

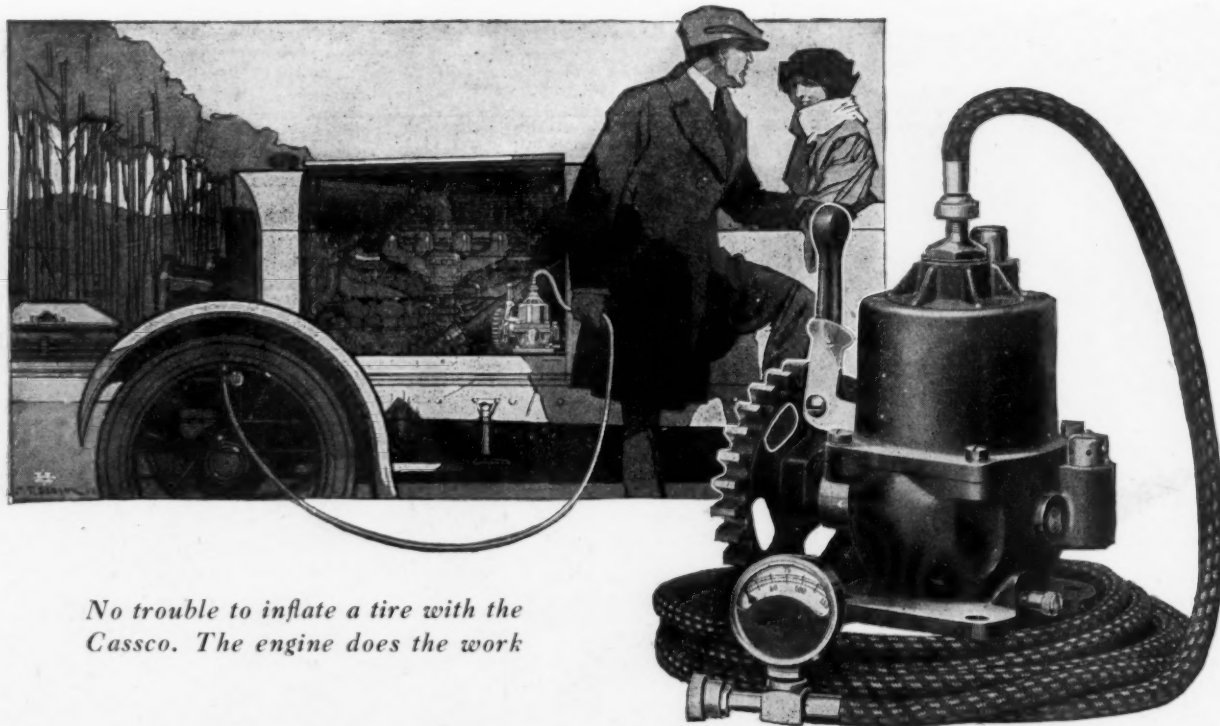
Arms, Carriages, Wagons and special purposes

Executive Offices, Cleveland, Ohio

When Writing to Advertisers, Please Mention Motor Age

Other Stanweld Products

Rims—clinchier detachable and demountable for single and dual equipment	Bands S. A. E.
Clincher Rims	Formed Tubing
Detachable Rims for Wire Wheels, special	Forging for Convertible Trucks
Millimeter Rims, all types	Ignition Wiring Tubes
Rim Tools	Lamp Brackets
Flanges and Fittings Solid Tire Demountable Equipment	Mast Sleeves
Tire Bases in Demountable and Pressed on Channels	Oil Tubes
Brake Rod Assemblies, complete	Radiator Rods
Starting Cranks	Starting Gear Rings and Boxes
Electric Welding of Parts	Straight Steel Tubing
Exhaust Tubes	Steering Gear Tubing
	Tail Pipes
	Torsion Tubes
	Truss Rods
	Tubing (straight and formed)



No trouble to inflate a tire with the Cassco. The engine does the work

Which do your customers prefer—

A back-breaking hand pump, or one which runs itself?

Not one of your customers is fond of his hand pump. It lames his back and ruins his tires. He uses it simply because it came with the car. In fifteen minutes you could sell him a Cassco Tire Pump.

You know that it is back-breaking work to fill tires properly with a hand pump. You know also that properly inflated tires give 40% to 100% more mileage. Prove this to the motorist and you will sell a Cassco five out of seven times.

The Cassco is a real tire pump. It will inflate a 34x4 tire to 80 pounds pressure in 90 seconds. Compare that with the work of any other pump. Women drivers are strong for the Cassco. It cuts

three-quarters of the annoyance out of punctures and all of the work out of pumping.

Big, profitable market

Every car owner who uses an old-fashioned pump is a prospect. New owners make particularly good customers. They generally buy a hand pump and tire gauge. Get them to add a few more dollars and buy a Cassco. The gauge on it is one of the finest made.

Dry, clean air

You know that oil ruins tires. In the Cassco a new design of piston and cylinder prevents oil spray. The Cassco is factory built—not assembled. 99.2% of the pump is manufactured in the

West Side Foundry Co. shops.

Demonstrate the Cassco

You will find more Cassco Tire Pumps on machines than any other make.

Your customers, too, really prefer an engine-driven pump to a provoking, undependable hand pump.

Show them that they will save the cost of a pump in a half season's mileage, and they will buy. Put a Cassco Tire Pump on your own car. Demonstrate it and you will sell it.

Write today for full information.

Complete with all fittings including fine gauge..... **\$15.00**
Powerful pump—easy to install.

Special For Fords - - \$10.00
Complete with all fittings including fine gauge
Powerful pump—easy to install.

Sales Department
EDWARD A. CASSIDY CO., Inc.
Madison Avenue at 40th St., New York City
Manufacturers
THE WEST SIDE FOUNDRY CO.
Troy, N. Y.

CASSCO TIRE PUMP

ENGINE DRIVEN



J and D Tires **Give Uninterrupted** **Mileage — Not** **"Adjusted" Mileage**

IT does not require claims for adjustment and trips to the repair shop to get 5000 miles from J and D Tires.

We have built *more* than 5000 miles of durability *right into them*. Their ability to meet and surpass their guarantee is inherent—in the way they are made, and in the materials they are made of.

You pay only once for each J and D Tire. And that is when you buy it. From then on it serves you without interruption—and keeps on serving you long after the 5000 mark has been passed.

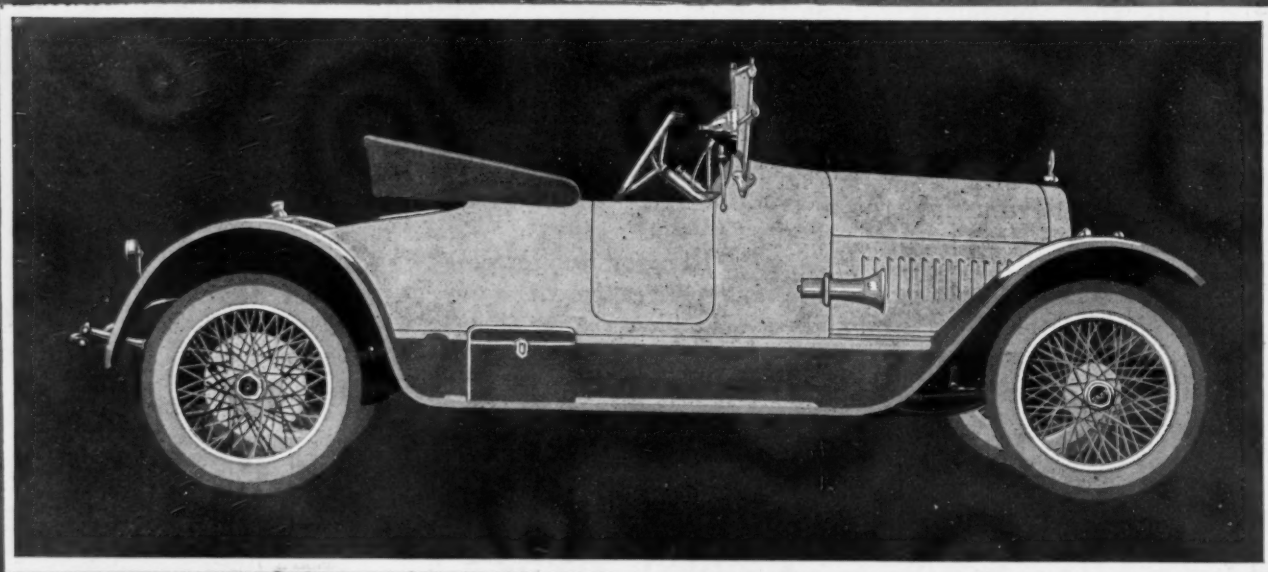
Four J and D Tires on your car will assure you a long period of positive economy and satisfaction, unique for its freedom from tire trouble.

Dealers: Every J and D Agency is protected by exclusive rights, and carries an attractive margin of profit. Perhaps your territory is still open. If so, you will find our proposition of real interest.

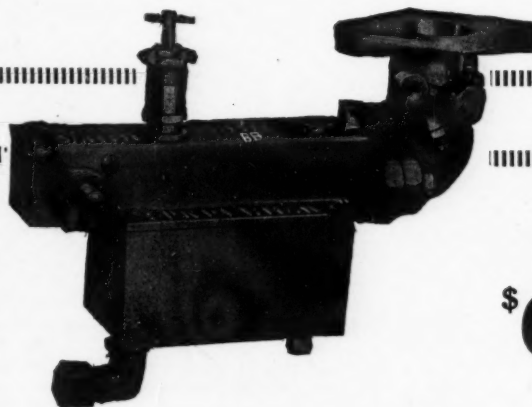
J & D TIRE COMPANY
CHARLOTTE N. C.



Stutz—
The
Car of
Quality



The Sunderman Carburetor Makes a Vital Contribution to the Industry in War Times



MODEL BB \$8
Without
Connection

\$10 with Regular
Connection

\$12 with Special
Connection

MODEL F

\$6 Special for Ford,
Metz and Saxon Four
F. O. B. Newburgh

It Economizes First—Installed on any motor, it saves from 30 to 50% in gasoline consumption. That's a safe assertion, as it saves up to 65% on some cars.

It Gives More Power to Any Engine—Its mixing principle is such that not only do you get more mileage per gallon, but it extracts all possible power from every drop. This is because of its infinitely fine break-up of the gasoline particles.

It Gives Much Greater Speed—The finely vaporized gasoline produces a much more rapid flame propagation, a more effective power impulse, enabling the motor to get to a higher speed level and to stay there—even beyond the hope of the engine's designer.

It Gives Greater Flexibility—The most experienced motorists demand Flexibility—that's why they pay small fortunes for multi-cylinder motors. The Sunderman Carburetor will give motors a velvety range of power and speed, from the crawling gait of congested traffic up to the hurricane burst of speed of the speedway.

In addition it gives all the little niceties of a perfect carburetor—quick starting, fast pick-up, economical idling, a power reserve for high hills and sandy roads.

The automotive industry needs these things—with every curtailment in car production the need for better carburetion on cars in use becomes more pronounced and the demand more urgent.

This is our most successful year—we have proved to our satisfaction that it pays to advertise when you have the goods. **WE HAVE THE GOODS.**

Our Carburetor is helping the industry in war times. It presents a fine opportunity to dealers, for there is a great replacement business waiting for attention.

It presents a fine opportunity to car manufacturers. They can put a new and finer talking point into their specifications by equipping with Sunderman Carburetors.

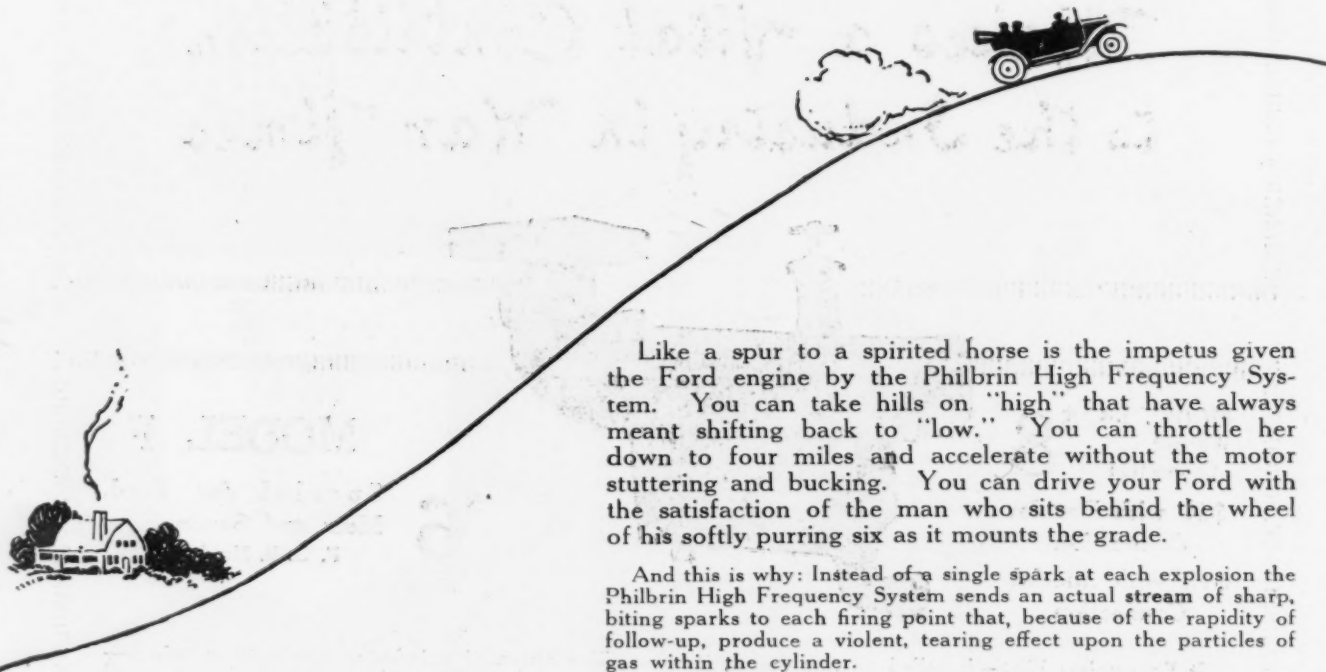
Car owners: Order direct from us, telling us the make and model of your car. We'll send you in return a Sunderman Carburetor adjusted to your motor's exact requirements and simple, concise directions for installation. If we have a dealer near you, we'll let him handle the transaction under our direction. But order NOW.

SUNDERMAN CORPORATION
11 Chambers Street Newburgh, N. Y.

SUNDERMAN

Vacuum Carburetor

Over the top on "high" without a single, faltering engine stroke—that's how a Ford will perform when equipped with this more efficient ignition.



Like a spur to a spirited horse is the impetus given the Ford engine by the Philbrin High Frequency System. You can take hills on "high" that have always meant shifting back to "low." You can throttle her down to four miles and accelerate without the motor stuttering and bucking. You can drive your Ford with the satisfaction of the man who sits behind the wheel of his softly purring six as it mounts the grade.

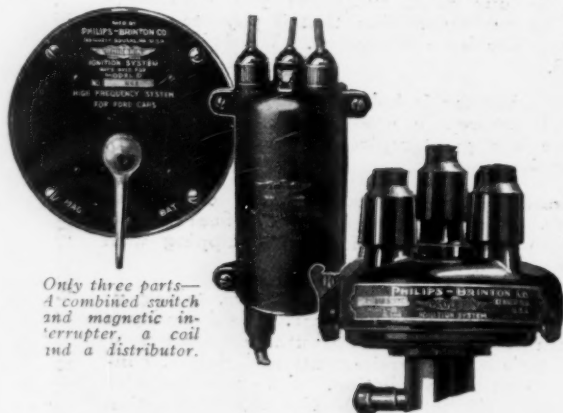
And this is why: Instead of a single spark at each explosion the Philbrin High Frequency System sends an actual stream of sharp, biting sparks to each firing point that, because of the rapidity of follow-up, produce a violent, tearing effect upon the particles of gas within the cylinder.

Apply the Philbrin High Frequency System and you can use a leaner mixture successfully. This system not only assures greater economy and increased power, but it also provides against any difficulty through faulty carburetor adjustment, inferior gasoline, or fouled spark plugs. Starting is also made easier as a result of the intensity and vigor of the high frequency delivery.

The Philbrin High Frequency System derives its current from the Ford magneto—no battery is necessary. Installation is easily made. Write now for descriptive folder. Plan to get every ounce of power, mileage and satisfaction out of your fuel.

Philbrin Ignition is also made in Duplex and Single Spark systems for all makes of cars.

Dealers—We desire representation on the Philbrin High Frequency System for Fords in all territories as yet unassigned. Our proposition is attractive, the field is big, the article of proven merit.



Only three parts—
A combined switch
and magnetic in-
terrupter, a coil
and a distributor.

PHILIPS-BRINTON COMPANY

505 SO. BROAD ST.

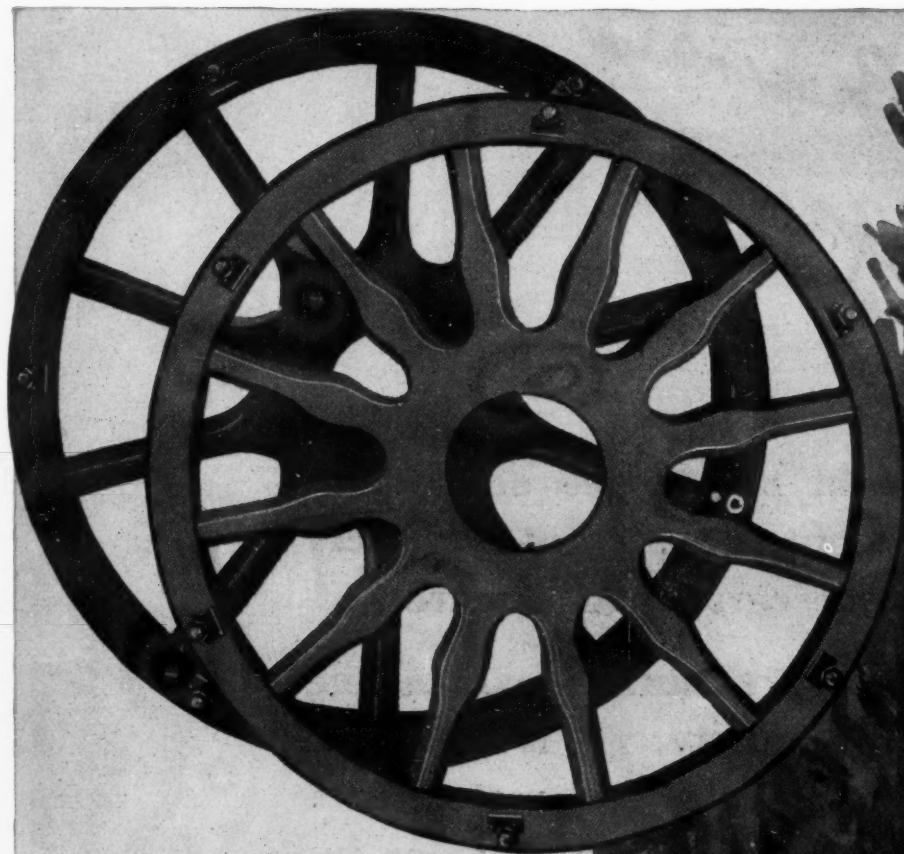
KENNETT SQUARE, PA.

PHILBRIN

High Frequency Ignition

FOR FORDS

When Writing to Advertisers, Please Mention Motor Age



20,000,000,000 feet of hickory

At the present time, it is estimated that there are twenty billion feet of standing hickory timber in the United States.

Twenty billion feet—a quantity utterly incomprehensible in its magnitude—means that the supply of hickory for the making of wood wheels for passenger cars is inexhaustible.

It means that the best passenger car wheels for all time to come will be made from hickory—the hard, tough, close-grained, resilient wood that has been proved by centuries to make the most efficient wheels.

AUTOMOTIVE WOOD WHEEL
MANUFACTURERS ASSOCIATION
105 NORTH 13th ST. PHILADELPHIA



WOOD WHEELS

for MOTOR
VEHICLES

When Writing to Advertisers, Please Mention Motor Age

*Start Your Business
Up-Grade Again*

Lalley-Light has turned actual loss back to profit again for many dealers since motor cars became scarce.

Its market is practically inexhaustible in any community. It is indeed a worthy substitute for motor cars while the shortage continues or increases.

It is vastly more than that, for it forms the basis for building a permanent, paying business, now, and far into the future, in conjunction with the automobile.

Write at once or wire for territory and other details.

Lalley Electro-Lighting Corporation
1821 Mt. Elliott Avenue
Detroit, Michigan

LALLEY-LIGHT

"Always runs and runs right"



A Year or Two More Service
is not too much to expect from your car
through equipping it with

GABRIEL SNUBBERS

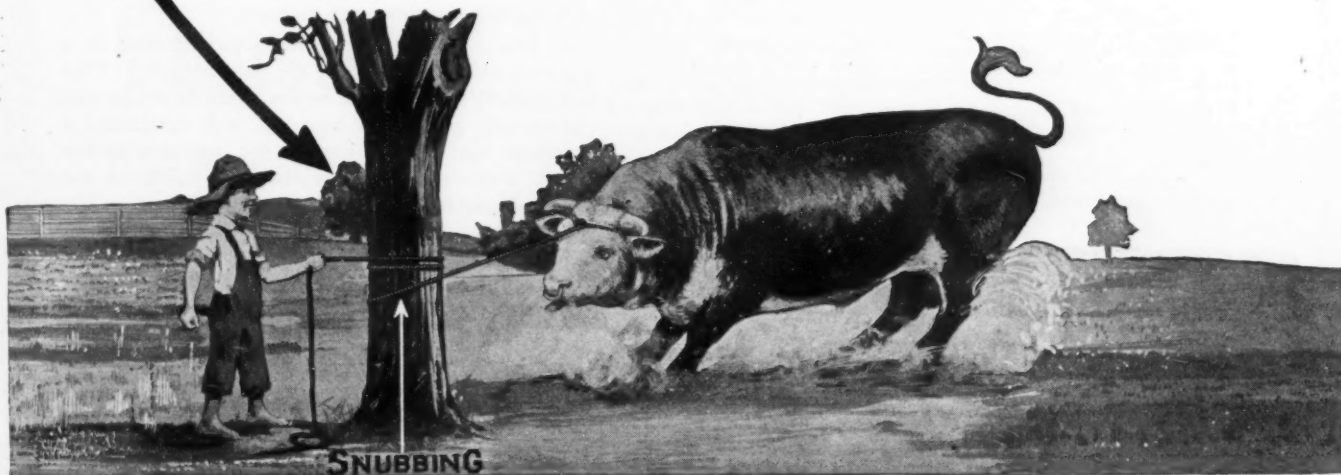
\$18, \$24, \$30 per set of four

The easier riding, reduced repair bills and freedom from spring breakage are all **extra** savings.

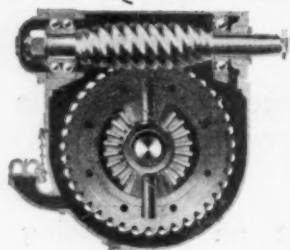
Standard factory equipment on the leading cars.

Send for literature

GABRIEL MFG. CO. 1415 East 40th Street Cleveland, Ohio.



When Writing to Advertisers, Please Mention Motor Age



THE WORM DRIVE

used in the Sheldon Rear Axle is the "straight" or David Brown type—the most durable and silent in operation as well as the most simple in construction.

The worm is forged from the finest steel heat treated to wear-proof toughness. The worm gear is made of a special formula bronze.

The accuracy with which the carrier housing casting is machined to receive the gear, the differential, the worm and the generous annular ball bearings which carry it, makes any further adjustments unnecessary.

The lubrication system is simple and thorough.

SHELDON

WORM DRIVE REAR AXLES

Thorough Lubrication of the Drive Will Double the Life of the Truck

It is not too much to say that Lubrication is the life of any rear axle.

The superiority of the worm drive is in a great measure dependent upon the thin film of oil between the worm and the worm wheel.

The Sheldon Worm Drive Rear Axle is designed so that this lubrication is obtained in a remarkably simple and thorough manner.

The lower section of the worm wheel runs in a bath of oil in the bowl of the axle housing. This is splashed through the worm shaft bearings and differential gears and bearings and maintains a constant film of oil between the surfaces of the worm threads and the worm gear teeth at the point of contact.

Sheldon design represents over fifty years of axle building.

SHELDON AXLE & SPRING CO.

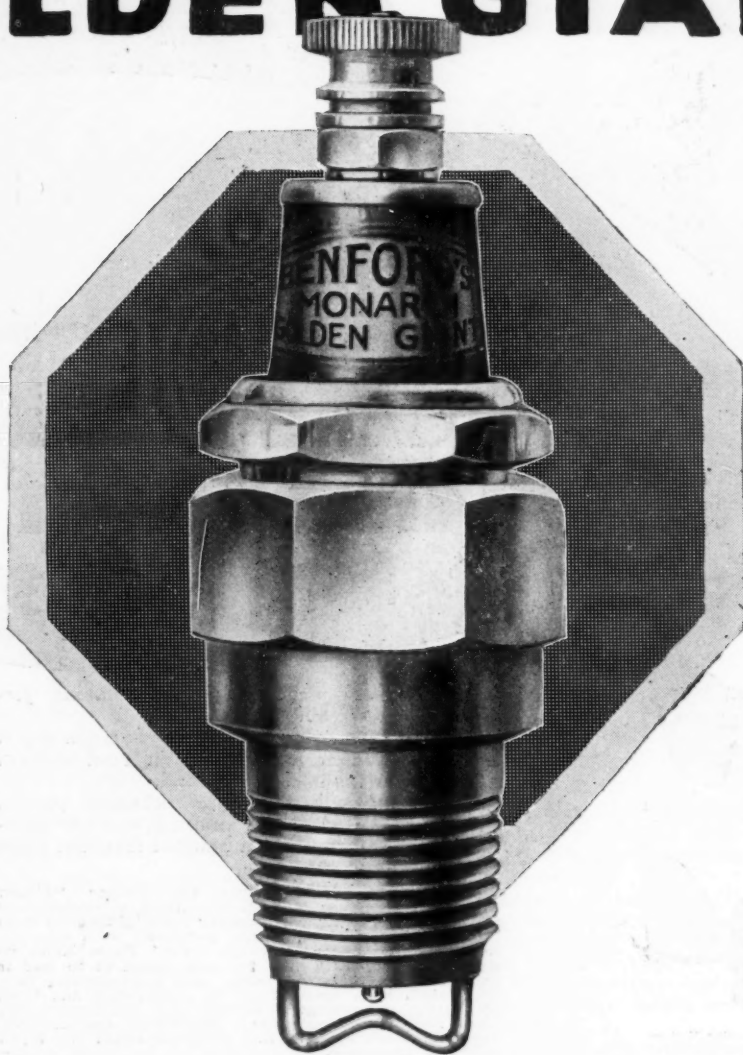


Makers of Springs and Axles for Heavy
Duty Service for more than Fifty Years



WILKES-BARRE, PENNSYLVANIA

BENFORD'S GOLDEN GIANT



FINISH

*The Refinement
of
Quality*

A BEAUTIFUL picture is framed beautifully. A car that is an engineering triumph naturally is crowned by a fine body.

Uncle Sam's battlers on land and sea are splendid in their trig, smart uniforms. We dress them that way to show our pride in them.

At the race tracks the sleek thoroughbreds with their painted hoofs show the owners' appreciation of nature's finest work.

Appropriate, all these—are they not?

Appropriate, in exactly the same degree, the coat of pure gold for the Golden Giant.

The Finest Spark Plug Made

BENFORD MFG. CO.

Mt. Vernon, N. Y.

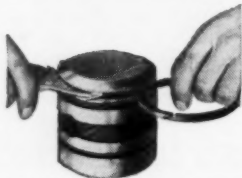


MUNGER

"Always Tight" Piston Rings



Ready to insert the Munger Re-grooving Tool to true-up a worn piston groove



The Munger Re-grooving Tool, in position for cutting. Testing width of groove with an overwidth ring



Showing how easily Munger "Always Tight" Piston Rings can be placed in the piston grooves with the Munger Ring Insertion Tool

Accessory Dealers and Garage Men!

Any jobber will supply you with Munger "Always Tight" Piston Rings. Order them now. List price for all sizes up to 3 1/2 in. diameter, \$1.25 per ring. With each complete outfit of rings, a Munger Piston Regrooving Tool and a Munger Ring Insertion Tool are supplied without extra charge.

A simple one-piece ring that remains permanently gas-tight!

A ring so easy to install that anyone can slip it over the Munger Ring Insertion Tool without breakage or trouble of any kind.

A ring that will give you increased power, greater speed, smoother running, a lower gasoline consumption and an unusual freedom from excess carbon.

By a patent process of peening the Munger "Always Tight" Piston Ring is made to conform to the shape of the cylinder. The Munger "Always Tight" Expansion Joint keeps it compression-tight until completely worn out. Each outfit of Munger "Always Tight" Piston Rings includes one *overwidth* ring for each piston, to be used in grooves that have become worn. Also a Re-grooving Tool, with which worn grooves can be straightened and trued up quickly and accurately without even disconnecting the piston from the connecting rod. This avoids expensive lathe work and effects a saving that every car owner and repair man will appreciate.

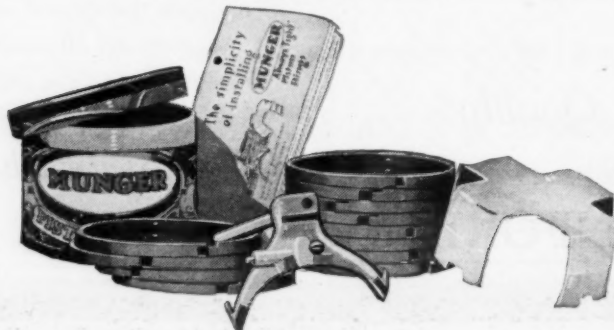
SPLITDORF ELECTRICAL CO. Newark, New Jersey

Splitdorf Branch Houses and Service Stations:

Atlanta.....10-12 E. Harris St.	Minneapolis...316 Hennepin Ave.
Boston.....68 Brookline Ave.	Newark.....278 Hasley St.
Chicago...2613 S. Michigan Ave.	New York.....7 W. 61st St.
Dallas.....402 E. Ervay St.	Philadelphia...210 N. 13th St.
Detroit....1295 Woodward Ave.	Pittsburgh.5943 Elsworth Ave.
Kansas City...1827 Grand Ave.	San Francisco...1022 Geary St.
Los Angeles...1215 S. Hope St.	Seattle.....1618 Broadway
Toronto.....469 Yonge St.	



The MUNGER
"Always Tight"
expansion joint



The MUNGER "ALWAYS TIGHT" PISTON RING OUTFIT—

8 "Always Tight" Rings
(Regular Size)
4 "Always Tight" Rings
(Overwidth)
1 Regrooving Tool
1 Ring Insertion Tool

When Writing to Advertisers, Please Mention Motor Age



—in an age of performance

THIS advertisement is addressed to that portion of the automotive industry which has dealt in and marketed passenger vehicles.

It is unnecessary to enter into a discussion of conditions forced by war times. The fine patriotism of the industry in voluntary restriction can only command the unbounded admiration of every American citizen.

The message we have for you—a dealer in passenger motor cars—is simply this:

A very great many dealers in passenger cars have found in the addition of commercial motor vehicles to

their business a means of not only maintaining the standards of previous years in volume of business, but have established new records of prosperity for themselves.

WORMLESS



WINTHER MOTOR TRUCK COMPANY

Dept. E, WINTHROP HARBOR, ILL.

We are happy to say that we count among the most successful Winther dealers many who formerly dealt only in passenger cars. The reasons for Winther success are manifold.

—A complete line of motor trucks from 1½ to 7 tons, of the highest quality produced in America. There is a Winther of the correct size and capacity for every trucking need.

—A record of actual performance in road service which has never been equaled. Truck efficiency means a vastly different thing than even a few months ago. Truck users now know "ordinary" road, traffic and service conditions are the exception.—Only that truck which is designed to deliver extraordinary service day in and day out can be sold today.

—And in an age of performance, WINTHER stands supreme.

—Efficient advertising.

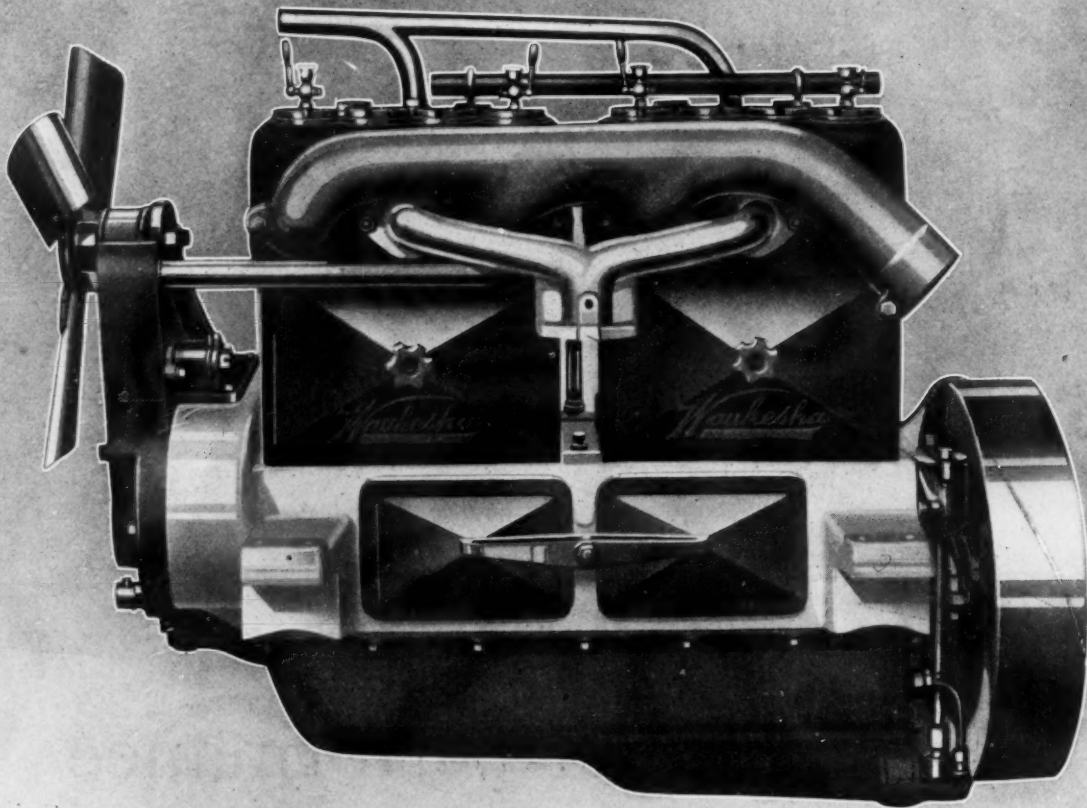
—Delivery on time. It is the fixed Winther policy to only make trade connections to an extent where we can be certain of keeping our promises on delivery.

We do not solicit new dealer connections indiscriminately. Increased facilities at present enable us to add possibly ten to our present list of Winther distributors.

To those who can measure up to Winther requirements, we have a proposition as exceptional as the truck itself.

The time to sell trucks is NOW.

Model 38, Maximum capacity 1½ tons Model 88, Maximum capacity 4 tons
Model 48, Maximum capacity 2 tons Model 108, Maximum capacity 5 tons
Model 68, Maximum capacity 3 tons Model 128, Maximum capacity 6 tons
Model 148, Maximum capacity 7 tons



By natural law, responsibilities gravitate to the man who can shoulder them. In a like manner the mechanical device which can best perform certain functions assumes the heaviest responsibilities in its particular sphere.

Waukesha
TRADE MARK

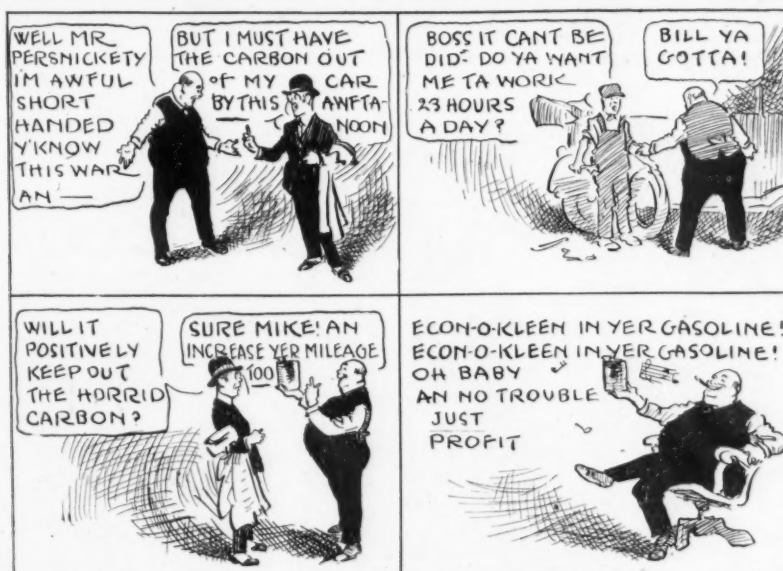
Four-Cylinder Motors for Trucks and Tractors

have attained a dominating position in the automotive industry because they possess that character which naturally invites the responsibilities incidental to arduous service.

"Demand a Waukesha Motor in the Truck or Tractor YOU Buy"

WAUKESHA MOTOR CO., Waukesha, Wis.

World's Largest Manufacturers of Truck and Tractor Motors Exclusively



YOU know how it is—help scarce, men overworked, carbon trouble growing worse as gasoline goes down in quality.

Something has got to be done.

We've done it!

We've discovered a combination of eight chemicals, which, when introduced into gasoline, makes all carbon in the gasoline available fuel—turns it into power—and makes present day low test gasoline burn as clean and as snappy as gasoline used to a few years ago when car owners never bought any gasoline under "82 test." We call it Econ-O-Kleen.

ECON-O-KLEEN

Goes in with the Gasoline—Keeps Motors Clean

It contains nothing that can possibly injure a motor. It merely purifies the gasoline and permeates it with oxygen, which makes it burn absolutely clean—and what is more, enables it to burn all the carbon already deposited in the cylinders.

It Pays Dealers to Handle ECON-O-KLEEN

Because: It improves your service by keeping carbon out of motors, enabling your mechanics to handle repair work promptly.

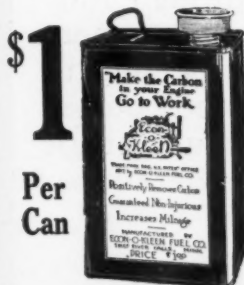
It pays you a profit on carbon cleaning without requiring any of your mechanics' time, when, as now, mechanics are hard to secure.

It's a big seller and pays a fine profit on every can. If you drive a car try Econ-O-Kleen.

Fill out the coupon and send it in today with \$1.00 for a trial can (enough to treat 112 gallons of gasoline).

ECON-O-KLEEN FUEL COMPANY

104 Labree Avenue, Thief River Falls, Minn.



\$1
Per
Can

ECON-O-KLEEN FUEL CO., Thief River Falls, Minn.
104 Labree Ave.
Send me complete information and free illustrated literature explaining every reason and use for ECON-O-KLEEN.
\$1 enclosed is for trial can of ECON-O-KLEEN.
Money back if not satisfactory.

Name
Address
Check here if you are a
dealer ☐ jobber ☐ or
supplier ☐ confidential
disclosure.



KING "8"

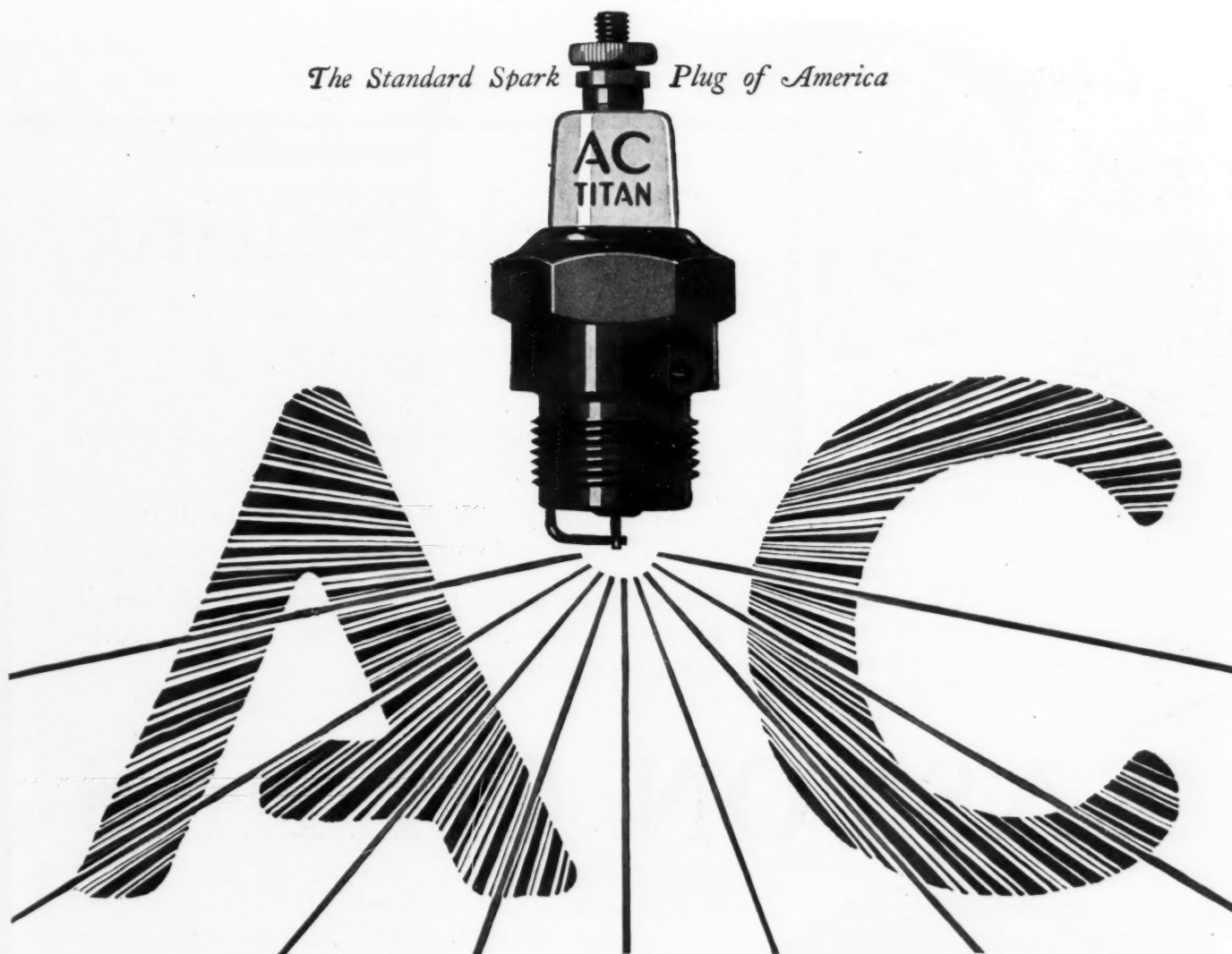
"You just can't help lovin' that car," said our North Carolina distributor, after driving a King through four miles of mud to the hubs. That's the way both dealers and owners talk when they really get to know this car. The King is second to none in appearance and performance on city pavements, but out of town, on the mud roads, is where this pioneer car wins you over for life. Write for particulars of our new bonus contract.

KING MOTOR CAR COMPANY
DETROIT



"The Car of No Regrets"

The Standard Spark Plug of America



Their Quality Has Created An Ever-Growing Demand

AC success has been built upon product-quality alone. For years most manufacturers have plant-equipped with AC Spark Plugs. These men could not afford to be swayed by extravagant claims. They proved AC's best by scientific tests.

The great army of owners of AC-equipped cars place confidence in the judgment of these manufacturers. They turn, naturally, to the AC dealer with their spark plug needs.

While not quite all manufacturers are yet equipping with AC's, with a full line of AC spark plugs on your shelves you are equipped to meet

best the demands of every car owner. For there are various types of AC Spark Plugs specially designed for every make and style of motor.

By stocking AC's exclusively you meet all demands and have a quality line that moves rapidly and never depreciates in value.

The big, national advertising campaign now appearing in the leading magazines is still further stimulating the demand for AC Spark Plugs. Alert dealers will stock the complete AC line now and cash in on their just share of this business.

Champion Ignition Company, FLINT, Michigan

The 93 well known manufacturers listed below use AC for standard factory equipment

Acme Trucks	Chalmers	Diamond T	Gramm-Bern-	Lexington-	Monroe	Paige	Sandow Trucks	Stewart Trucks
Advance-Rumely	Chandler	Trucks	stein Trucks	Howard	Moreland Trucks	Paterson	Sanford	Stutz
Tractors	Chevrolet	Dorris	Hatfield	Liberty	Murray	Peerless	Saxon	Titan Trucks
American-	Cole	Dort	Haynes	Locomobile	Nash	Pierce-Arrow	Scripps-Booth	Walls Tractors
La France	Continental	Duesenberg	Hudson	Marmon	National	Pilot	Signal Trucks	Waukesha
Anderson	Motors	Motors	Hupmobile	Maytag	Netco Trucks	Premier	Singer	Motors
Apperson	Crane-Simplex	Federal Trucks	Jackson	McFarlan	Oakland	Reo	Smith Motor	Westcott
Brockway Trucks	Daniels	Ford & Son Tractors	Jordan	McLaughlin	Old Reliable	Republic Trucks	Wheel	White
Buffalo Motors	Davis	F-W-D Trucks	Jumbo Trucks	(Canada)	Trucks	Riker Trucks	Stearns-Knight	White Trux
Buick	Deere Tractors	Gabriel Trucks	Kissel Kar	Menominee	Oldsmobile	Rock Falls	Stephens	Wisconsin
Cadillac	Delco-Light	Genco Light	La Crosse	Trucks	Oneida Trucks	Rutenber Motors	Sterling Motors	Motors
J. I. Case	Dodge Brothers	G. M. C. Trucks	Tractors	Moline-Knight	Packard	Samson Tractors	Sterling Trucks	

Dealers: What does all this mean to you in your aim to give your customers the best?

When Writing to Advertisers, Please Mention Motor Age



Quick-Selling

features of these, the best emergency traction devices on the market, are

—no jacking, no moving of car to attach. Just throw unit chains over tire, snap, snap!—that's all.

—on or off in a jiffy. "Grip like mudhooks, ride like bare tires."

—and low price to the buyer; with small investment in but 3 sizes, and liberal profits for the dealer.

EASY ON CHAINS



are exactly the kind of accessory you are looking for—quick turn-over, nice profits, and growing demand—over 75,000 sets now in use.

*Write Today for
Open Territory and Terms*

Woodworth Worth-while Automobile Economies offer you specialties to help build a successful patronage. Address—

RETAIL PRICES: Packed—set of 8 to the bag—4 for each rear wheel. Small size fits 3 or 3½ tires, \$4 per set; medium size fits 4 or 4½ tires, \$5 per set; large size fits 5 or 5½ tires, \$6 per set. Extra sizes for truck requirements.

WOODWORTH MFG. CORP.

2046 Whirlpool St., Niagara Falls, N. Y.
(For Canada) Niagara Falls, Ont.



MOON CARS

Six-66

7-passenger Touring and
Club Roadster

\$1985

f. o. b. St. Louis

Six-36

5-passenger Touring

\$1295

f. o. b. St. Louis

Moon car owners demonstrate their pride of ownership by identifying their cars with their monogram. Not many cars selling at popular prices inspire such pride of possession and prompt this touch of individuality and distinction.

Appearance and performance go hand in hand. From their Red Seal Continental Motor to the last appointment they bespeak quality and refinement.

These brief specifications prove that the quality is more than skin deep and explain the success Moon dealers have everywhere.

SIX-66

A motor car de luxe in every sense of the word.

125-inch wheelbase—Red Seal Continental Moon Motor—honeycomb radiator—new high type with removable shell—Delco starting and ignition system—Timken axle and bearings—Double ventilating and rain vision windshield—Stewart speedometer—upholstery of fine leather or whipcord, stuffed with curled hair—wide doors with concealed locks and hinges.

SIX-36

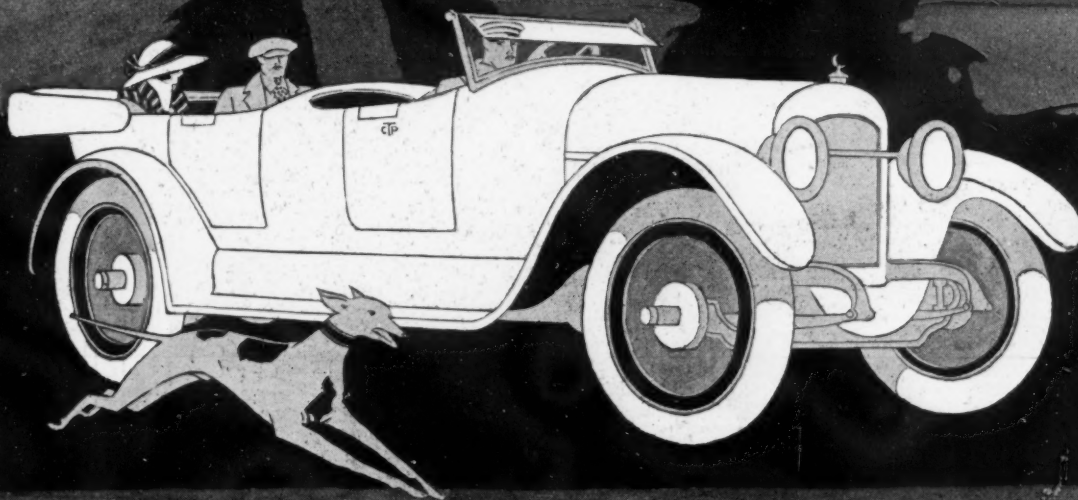
The light Six that has scored so heavily because of its extreme smartness, close price and after-economy.

114-inch wheelbase—Red Seal Continental Motor—new high honeycomb type Fedders radiator—Delco ignition—Two-unit improved starting and lighting system—Timken axle and bearings—Solid walnut instrument board, front and rear—Sweeping double cowl—Slanting windshield—Electric lights with dimmer system operated from dash.

A little extra good territory still left

MOON MOTOR CAR CO., St. Louis, U. S. A.

*Prices subject
to change
without notice.*



When Writing to Advertisers, Please Mention Motor Age

Selden Trucks

Construct

Construct, upbuild, speed up in your business.

It is essential that the business of the nation move forward—that back of our iron-hearted men in Khaki and the big guns at the front there will be prosperous industries to provide food, equipment and ammunition to WIN THE WAR.

For every motor truck you install in your business you release two or three men for other productive labor—you increase your productive capacity without increasing your pay roll.

Install massive, powerful Selden "Inbuilt Quality" Trucks—for there is no profit in the operation of trucks that

are not possessed of the stamina of Selden Trucks—that are not physically able to render the dependable, continuous, economical, and therefore profitable service that Selden Trucks have proved time and time again their ability to render.

Buy a SELDEN—It's ALL Truck.

One to Five Ton Worm and Internal Drive Models.

Write for full information on your haulage problems; or if you are a dealer and Selden Trucks are not being sold in your territory, write us for our Dealer Proposition.

SELDEN TRUCK SALES COMPANY

ROCHESTER, N. Y., U. S. A.



EISEMANN

Away Goes Guesswork When Facts Step In

You need not depend upon impressions or opinions—your own or the other fellow's—to decide what source of ignition will give you the best service on truck or tractor or passenger car.

The superiority of the Eisemann Magneto is one of those demonstrated facts which are not open to argument.

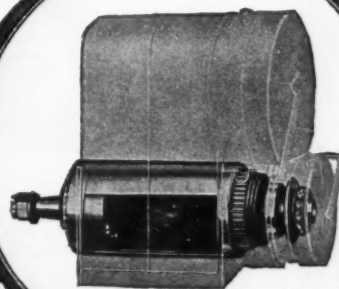
Tests—competitive tests—tests under all conceivable conditions—tests conducted by ignition authorities of unquestionable standing—have proven conclusively the superior efficiency, dependability and durability of the Eisemann Magneto.

It is for this reason and no other that 126 manufacturers of motor vehicles—including practically all the recognized leaders who have established reputations to maintain—have adopted Eisemann Magnetos as standard equipment.

THE
EISEMANN
MAGNETO-COMPANY

32 Thirty-third Street
CHICAGO
910 So. Michigan Ave.

BROOKLYN, N. Y.
DETROIT
802 Woodward Ave.

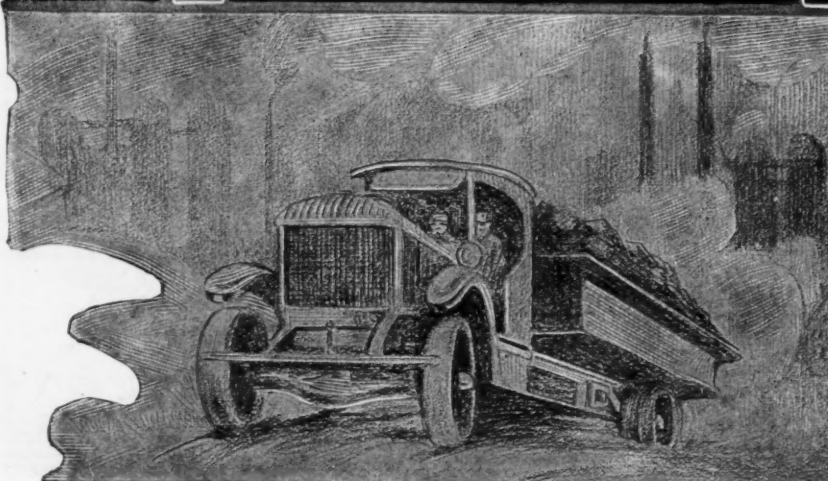


EISEMANN SUPER-CONSTRUCTION

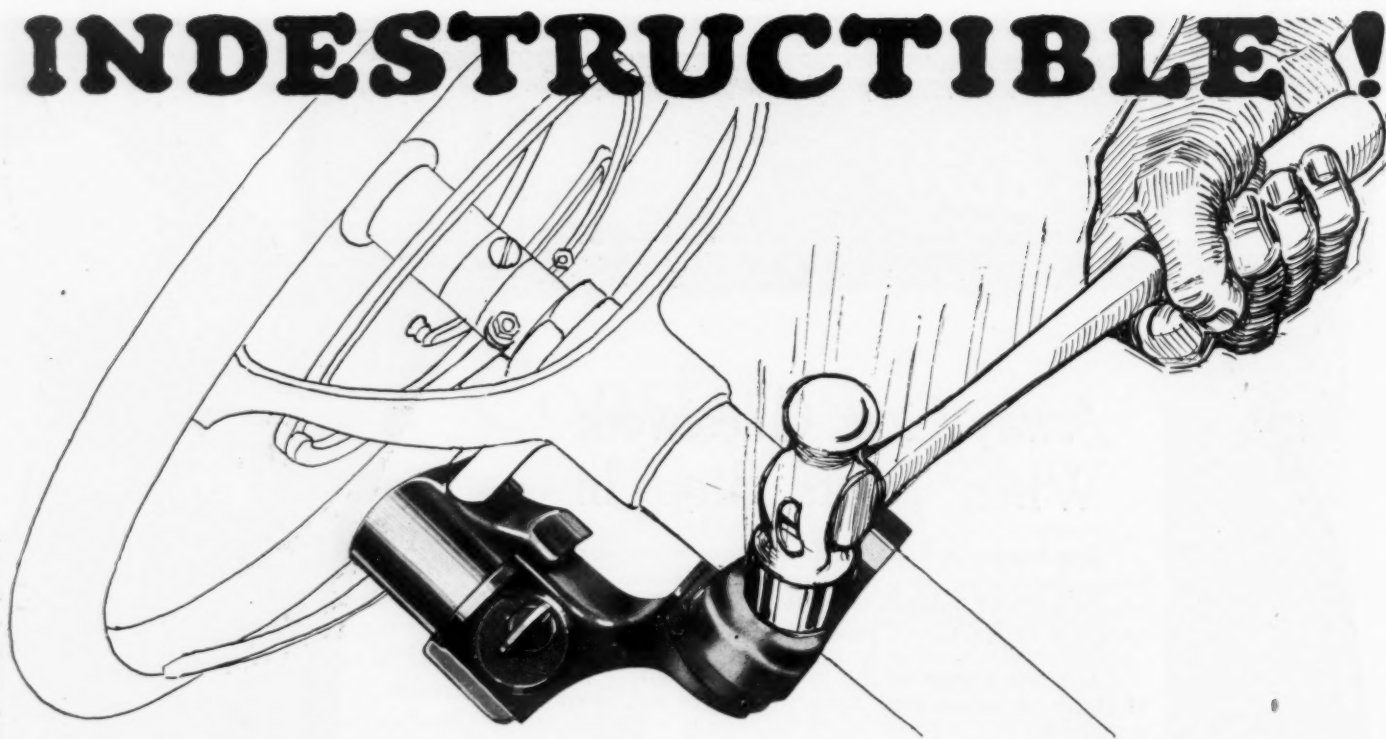
2. The Armature

The making of the armature of an Eisemann Magneto is an excellent illustration of the exhaustive and scrupulous attention to detail through which this company has realized its determination to produce the finest magneto that can be built.

To complete the armature core and winding from raw material to finished product requires 49 distinct operations, inspections and tests. Though these processes cannot be described here, it should be pointed out that owing to the extreme care applied both to the selection of materials and to the processes of construction, Eisemann armatures practically never short circuit or burn out. The shadowgraph above reveals the position of the armature with relation to the magneto as a whole.



INDESTRUCTIBLE!



THIS lock is not only handsome—a real addition to the looks of your steering column—but it is *strong*. No thief can break it, pick it, detach it or pry it loose.

Made of an exceedingly hard, tough metal, it presents a smooth, even surface that offers no hold for "jimmy" or crowbar. It cannot be smashed, bent or twisted free.

Goodrich

STEERING COLUMN LOCK

WITH YALE CYLINDER

The screws with which you fasten it on—5 altogether—attached in a moment—are entirely covered when the key is turned. The thief cannot use his screwdriver. The famous Yale Lock is unpickable and unsmashable.

The connections are dovetailed, leaving no crevices or sharp projections.

Right at your hand for use—it is out of your way when unlocked.

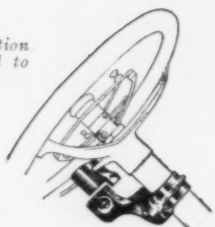
It complies strictly with all Police and Fire regulations, as it locks front wheels in "straight ahead" position. Car can be moved forward or back, but cannot be driven or towed away.

Dealers: You're going to have more calls for locks this year, and this is the Kingpin of all locks. We advise placing orders now for your future requirements, in order to avoid possible disappointments in deliveries.

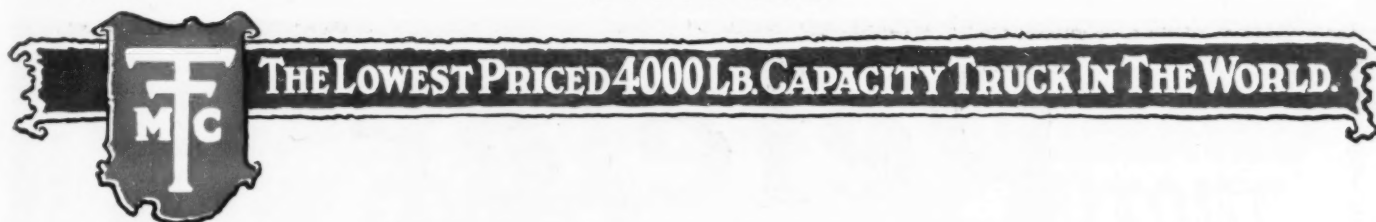
GOODRICH-LENHART MFG. CO.,

419 Widener Bldg., Philadelphia, Pa.

Unlocked Position
—allows wheel to
turn freely



This section can
be easily and en-
tirely removed
when desired



—and again we say!

Traffic Truck

4,000 LBS. CAPACITY

ST. LOUIS, MO.

\$1,095

the compelling opportunity of a life time.

Within the last few weeks we have closed many contracts. We have had hundreds of letters, hundreds of telegrams, asking for reservations of territory, but again we say, we want you to come to St. Louis—see our plant, look over this wonder-truck—investigate our proposition.

Territory is closing fast—our entire sales organization is busy right here at the factory in showing our plant, demonstrating the Traffic and closing territory. Sales and production are jumping, but we are determined on wide national distribution, and we mean to have only successful, aggressive, representative dealers handling Traffic Trucks.

The Truck question is settled—you MUST sell them—everyone who has hauling to do must eventually use them. But realize now, that to secure territory on the one greatest truck proposition in the world today, you must act and act now.

IMMEDIATE DELIVERY—Wire to find out whether or not your territory is open—then get on the train and come to St. Louis—meet us and see the Traffic perform and produced.

TRAFFIC MOTOR TRUCK CORPORATION
3807-19 Laclede Avenue ST. LOUIS, MO.

SOME TRAFFIC FEATURES: Weight—3,300 lbs.; Gray Motor, 4-cylinder, valve-in-head, 35-h.p. Covert Transmission; Multiple disc clutch; Kingston Magneto; Cellular type Radiator; Drop forged Front Axle with Timken roller bearings; Russell Rear Axle, internal gear, roller bearings; Semi-elliptic front and rear Springs; 6-inch U-channel frame; Standard Fisk Tires; 133-inch Wheelbase; 122-inch length of frame behind driver's seat; Oil Cup lubricating system—and many other features for perfect performance.



\$1095
F.O.B. ST. LOUIS

Peteler

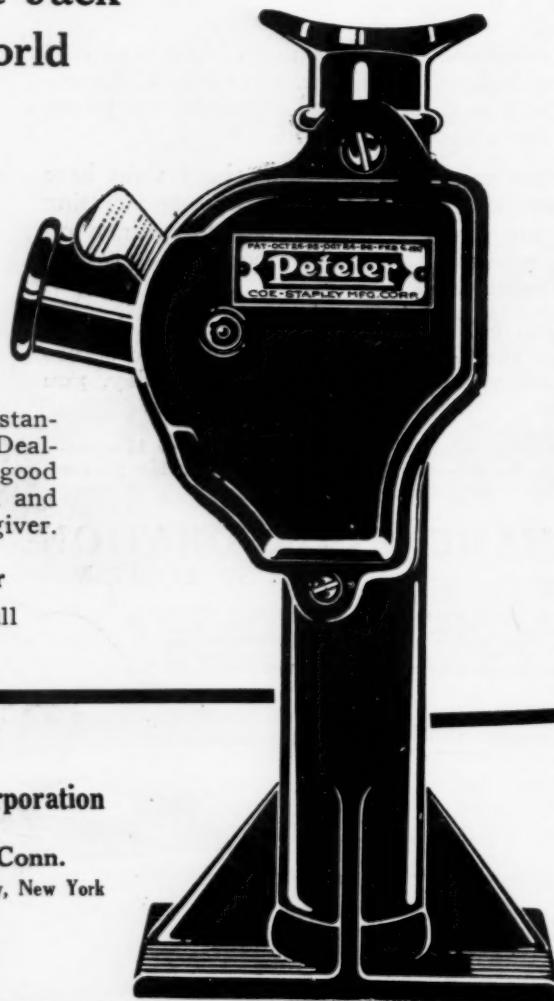
AUTO JACK

\$6.00

**for the Best Jack
in the World**

There is a good substantial profit in this for Dealers, and the jack is good looking, easy to sell and a sure satisfaction giver.

Ask Your Jobber
or write us for full particulars.



STAND the Peteler up with a lot of other jacks and a customer will pick it out every time on looks alone.

And *in action* there is nothing to it. Just let a motorist operate a Peteler *once*. That's all that's necessary to make a sale.

Note These Advantages

Strength. Will raise 3,000 lbs. —a ½-ton of surplus power.

Safety. Has no danger point. Can be raised safely to limit of lifting bar.

Long Handle. No crawling under car to place or operate jack.

Short Stroke. Prevents interference of car overhang, no matter how far under car jack is placed.

Speed. Raises ¾" to a stroke, much faster than other jacks.

Reverse. Simple turn of handle reverses action and sends rack down step by step. When load is removed, a slight lift of handle drops lifting bar all the way down.

Coe - Stapley Mfg. Corporation

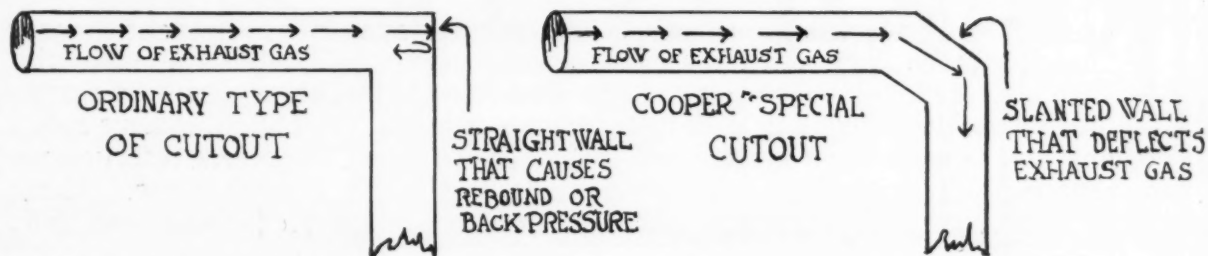
Factories: Bridgeport, Conn.
Executive Offices: 135 Broadway, New York

When you need a jack
you need a good one.

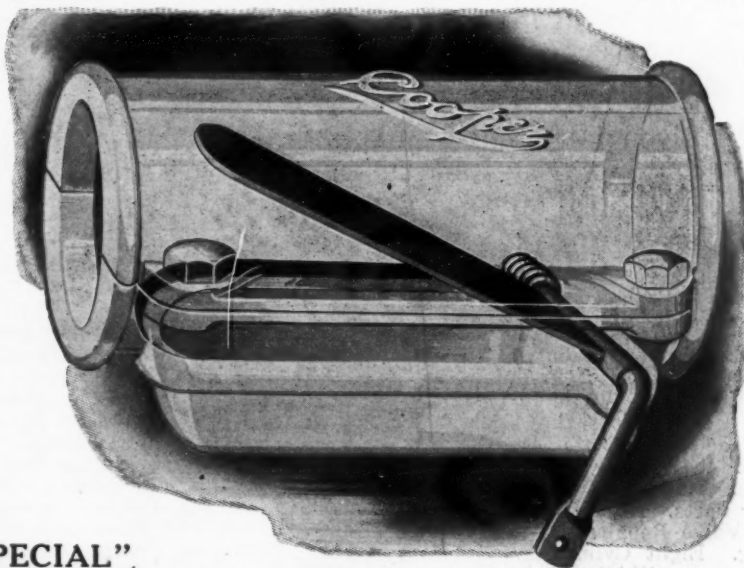
In an emergency a poor
jack is a tragedy, isn't it?

COE-STAPLEY

ALL BACK PRESSURE IS ELIMINATED IN THE COOPER "SPECIAL" CUTOUT



The above designs show why there can be no back pressure in the Cooper "Special" Cut-out. Instead of coming in contact with a straight, perpendicular wall which will naturally cause a rebound, the gas comes in contact with a *slanted* wall which deflects the gas. This is the secret of the tremendous success of Cooper "Special" Cut-Out.



"COOPER SPECIAL"

The construction and principle of the Cooper "Special" will appeal to the judgment of the man who *knows* what a good cut-out should be like.

—The slanted flapper and large exhaust opening prevent back pressure.

—The exhaust pipe is not cut in two to accommodate this cut out.

—The flapper is opened three inches by pushing the foot pedal down one-half inch.

—The lock on the foot pedal works instantly and never fails.

The Cooper "Special" Cut-Out (for all makes of cars) does its work in a simple, efficient manner and never gives the least trouble.

Dealers—Get a stock from your jobber—get the benefit of our extensive advertising.

	No. 3 Pedal	"O" Pedal
1½" Outfits with.....	\$2.50	\$3.00
1¾" and 1½" Outfits with.....	3.00	3.50
2" and 2¼" Outfits with.....	3.50	4.00
2½" and 2½" Outfits with.....	4.00	4.50



Pedal No. 3

COOPER MFG. COMPANY, Marshalltown, Iowa

Exclusive Sales Representative
THE FULTON COMPANY, MILWAUKEE, WISCONSIN

I enclose \$....., for which please send me "Cooper Special"
to fit my make of car Size of exhaust pipe is.....
I buy my accessories from.....
Signed..... Address.....



Style 0 Pedal

Automobile Repairing Made Easy

By LT. VICTOR W. PAGE, M. E.

Member Society of Automobile Engineers
Author of "The Modern Gasoline Automobile Aviation Engines," Etc.

PLANs for workshop construction, suggestions for equipment, power needed, machinery and tools necessary to carry on business successfully are also included. This work starts with the engine, then considers carburetion, ignition, cooling and lubrication systems. The clutch, change speed gearing and transmission system are considered in detail. Contains instructions for repairing all types of axles, steering gears and other chassis parts. Many tables, short cuts in figuring and rules of practice are given for the mechanic.

Explains fully valve and magneto timing, "tuning" engines, systematic location of trouble, repair of ball and roller bearing, shop kinks, first aid to injured and a multitude of subjects of interest to all in the garage and repair business.

This book also contains special instructions on electric starting, lighting and ignition systems, tire repairing and rebuilding, autogenous welding, brazing and soldering, heat treatment of steel. Latest timing practice. Eight and twelve cylinder motors, etc.

The information given is founded on practical experience, everything is explained so simply that motorists and students can acquire a full working knowledge of automobile repairing.

Condensed Synopsis of Contents

CHAPTER 1. The Automobile Repair Shop. Buildings for Repair Work. Machinery and Power. Arrangement of Departments. Bench and Floor Equipment. **CHAPTER 2.** Small Tool Equipment for Repair Shops. Tools for Adjusting and Erecting. Precision Measuring Tools and Their Use. Special Tools. Complete List of Tools and Supplies Needed. **CHAPTER 3.** Overhauling the Gasoline Engine. How to Dismantle Motor. Defects in All Motor Parts. Repairing Scored and Cracked Cylinders. Valve Repairs. Fitting Bearings. Valve Timing. Eight Cylinder V Motors. Sleeve Valve Motors. **CHAPTER 4.** Cooling Carburetion and Lubrication System Faults. Overheating Radiator Repairs. Water Pump Repairs. Fuel Feed Methods. Adjusting Carburetors. Oiling Systems. Where to Look for Lubrication Trouble. **CHAPTER 5.** Location and Remedy of Ignition Faults. Battery Ignition System. Magneto Systems. How to Find All Ignition Troubles. Magneto Care and Adjustment. Modern Ignition

Timing. **CHAPTER 6.** Motor Starting and Car Lighting Systems. Leading Systems Described in Detail. Wiring Diagrams. Tracing Faults. **CHAPTER 7.** Clutch and Gearbox Faults. Principal Clutch Troubles Outlined. Clutch Repair. Planetary Gear Sets. Friction Drives. Sliding Gear Transmissions. **CHAPTER 8.** Faults in Chassis Components. Overhauling the Chassis. Spring Repairs. Steering Gears. **CHAPTER 9.** The Rear Axle and Driving System. Semi, Three-Quarter and Full Floating Axles. Care of Drive and Differential Gears. Axle Bearings. **CHAPTER 10.** Wheels, Rims and Tires. Wire Wheels. All Types of Rims. Rebuilding and Repairing Tires. **CHAPTER 11.** Miscellaneous Repair Processes. Autogenous Welding. Heat Treatment of Steel, Brazing and Soldering. **CHAPTER 12.** Useful Information. **CHAPTER 13.** Hints, Kinks, Recipes, and Formulae. **CHAPTER 14.** Useful Tables for Mechanics. Mathematical, Mechanical, including Horsepower and Speed Charts.

Every Motorist, Dealer, Student, Blacksmith and Wheelwright, Demonstrator, Repairman, Chauffeur and Garage Owner will find this work of reference invaluable. More useful than any other tool in the Motorist's kit.

1056 Pages 5½x8 Inches. 10 Folding Plates. 1000 Engravings on 500 Plates.
Cloth Bound. Price \$3.00 Postpaid

U. P. C. BOOK COMPANY, Inc.

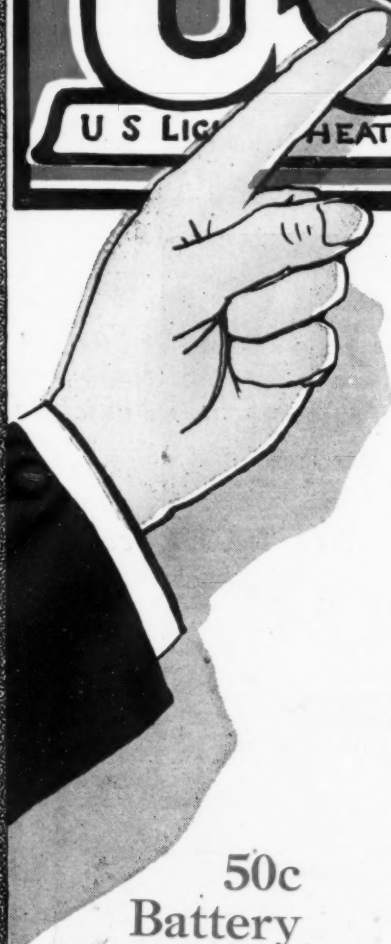
Successor to Motor Age Book Dept.

243-249 W. 39th Street, NEW YORK

When Writing to Advertisers, Please Mention Motor Age

USL BATTERY SERVICE STATION

U S LIGHT & HEAT CORPORATION



50c Battery Book Free

The "Black Mystery Box Explained," a text book on the storage battery, used by schools and colleges. It will be sent you Free if you mention the make and model of your car.

DON'T be persuaded that your old Battery is "dead" and that you must buy a new one, until the USL Service Station has inspected it. They repair many batteries others call hopeless.

Best of all, if they see it can be repaired, they will offer you a Guaranteed Adjustment Plan, on the basis that the repair is worth a certain price to you if the repaired battery shall serve you for at least eight months.

Should the battery fail within that time, you'll receive a credit, reducing the repair price pro rata cost for as many months of service as you actually get from the repair. And the credit will apply on a brand new USL Battery that contains the famous USL machine-pasted plates.

USL service stations serve you honestly, courteously and promptly. Let the USL service station in your town prove it.

U S Light & Heat Corporation,

Factory: Niagara Falls, N. Y.

Branches: New York, Chicago, San Francisco, Detroit, Kansas City, Washington, D. C.

The Quick and Economical Way To Refinish a Dull-Looking Car

A sample of Panvar will be sent free upon receipt of 10 cents in stamps to cover the cost of mailing.

WHEN CARS BECOME DULL and lose their lustre, a refinishing coat of Panvar will make them look like new again. A dull-looking car need not be completely repainted—all it needs is a final lustre coat of Panvar, which you yourself can easily apply.

Panvar is a transparent enameling lacquer that gives to any color car a lasting lustrous finish such as it had when it left the factory.

Unlike varnish, however, Panvar is self-leveling and as quick flowing as water.

This explains why it is so easy to apply and why it never shows brush marks or streaks.

This is an exclusive Panvar feature that overcomes the big objection car owners have to refinishing their cars themselves.

Panvar is amazingly easy to apply and gives a lasting finish that is impervious to water, heat, steam or sun, and protects metal parts against rust.

Being transparent, it can be applied to any color of body.

Unlike varnish, too, Panvar dries hard within eight hours; just apply at night and the car is ready for use in the morning.

If your regular dealer cannot supply you, order direct.

Price, \$1.50 per quart (enough to refinish a car).

Special Offer to Dealers

IF it is impossible for your regular jobber to supply you immediately with Panvar, we will for the next 30 days ship Panvar to you direct by express, all charges prepaid, in cases of a dozen quarts at \$12.00 a case (the same price you would pay your jobber).

Each case shipment also contains 12 individual samples for demonstrating purposes (every Panvar sample makes a sale). Each case shipment contains ample advertising literature for counter and window use.

The Panvar Company

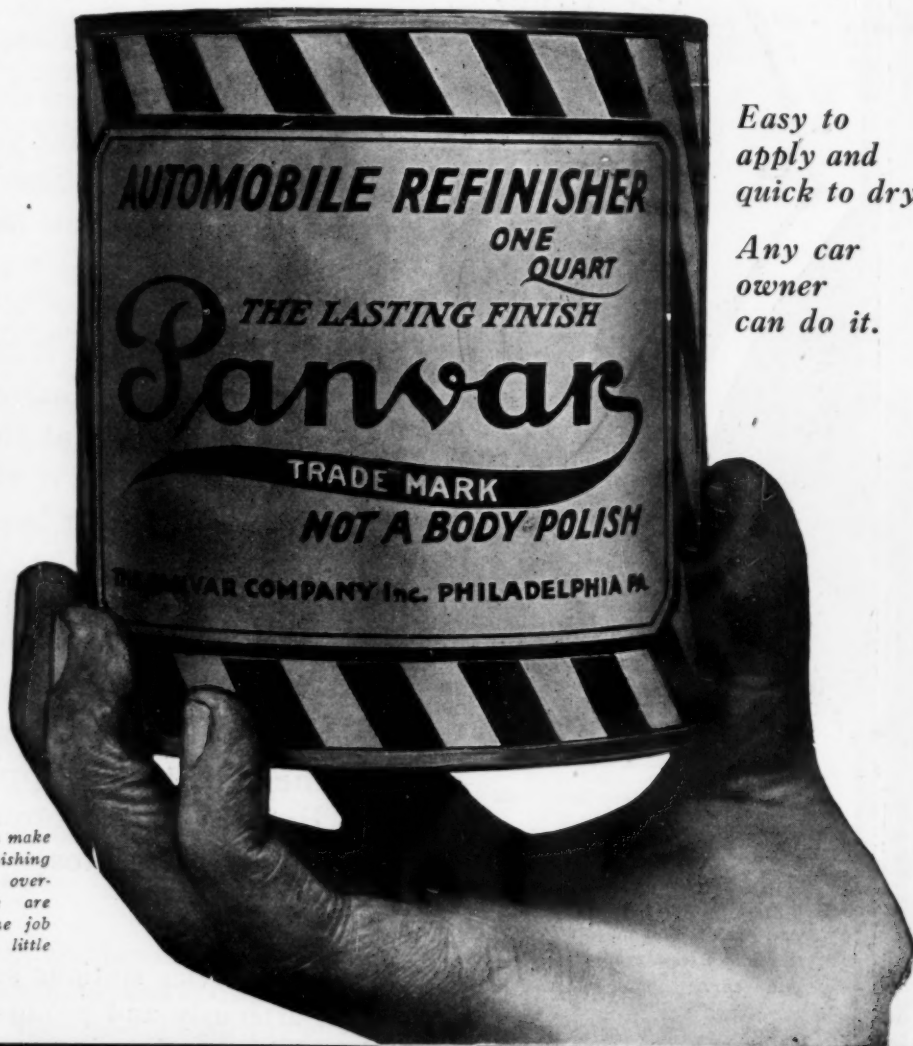
606 Bulletin Bldg.

Philadelphia, Pa.

H. A. MEYERCORD—Sales Manager



Garage men can make big profits refinishing customers' cars overnight. Results are amazing and the job requires very little time or effort.



Easy to apply and quick to dry.

Any car owner can do it.

DEALERS

Time Saver Coupon

Rush by express, all charges prepaid, one dozen quarts of Panvar, including samples and advertising, for which I enclose money order for \$12.00.

Firm Name

Address

By

MOTORISTS

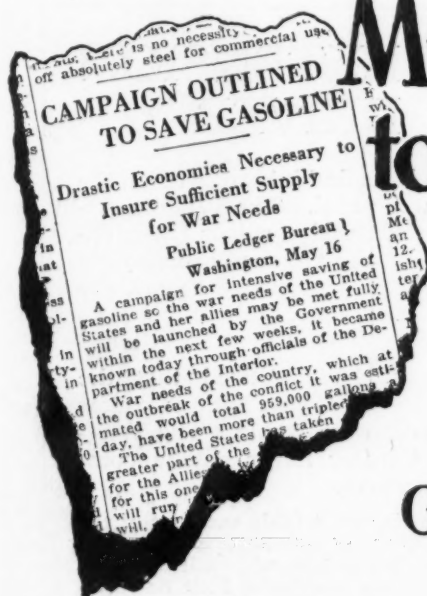
Free Sample Coupon

Enclosed find 10 cents in stamps to cover the cost of mailing me a free sample of Panvar. I wish to see for myself if Panvar is all you claim it to be.

Name

Address

When Writing to Advertisers, Please Mention Motor Age



Must Save Gasoline to Supply War Needs!

According to the newspapers, drastic economies are necessary to insure a sufficient quantity of gasoline for war needs. War needs at the outbreak of the conflict were estimated at 959,000 gallons a day. This amount has been tripled as the United States has taken over the greater part of gasoline fueling for the Allies.

Certain restrictions of gasoline for the use of motorists are sure to be in evidence. Why not get ready for them now by installing

The REMINGTON GASOLINE SYSTEM For your FORD

Heeza Gainer Says:
"Don't Be a Gasoline Slacker"



A system that cuts a third off your gasoline bill, gives more power, provides a foot accelerator, insures perfect control and gives you that ease of operation which is one of the strongest features of the high-priced car. It means a bigger upkeep saving than you have ever known—a better travelling record than you have ever had.

One user has averaged 24 miles per gallon for 18 months, obtaining on several test runs as high as 40 miles per gallon.

The Remington Gasoline System is quickly and easily attached, without cutting the floor board, and does not in any way interfere with the standard Ford equipment. Write today for your copy of a mighty interesting folder.

THE REMINGTON MANUFACTURING COMPANY

Chicago Office: 62 East Lake St.

1142 Real Estate Trust Bldg., Philadelphia



SHIELDS INJECTOR

AN EFFICIENT "GREASE GUN"

The old way of injecting grease with a paddle is messy, inconvenient and slow. With Shields Injector motorists can now inject the grease in a clean, quick, efficient way.

The gun holds a cartridge which contains 1½ pounds of high grade grease.



A turn of the handle and the grease is injected. In a couple of minutes the job is over. No greasy hands or ruined clothing. Quick, easy, simple to operate—always ready when wanted.

Made of steel finished in black enamel, with nickel plated ends and handles. Nothing to get out of order—strong, durable in construction.

For a Limited Time Only We Will Make This Special Offer:

Send us the name of your dealer and we will send you a Shields Injector and 12 cartridges of grease (as illustrated below) worth \$7.30, for \$4.80. No advance payment required except 50c to pay return charges, should you not accept delivery. We will ship by C. O. D. Express with privilege of examination. The Injector retails at \$2.50 and the cartridges at 40c each.

Here's a chance to save \$2.50 and get an article that you would not part with after using once. The Shields Injector is well worth the regular price, and this special offer represents an exceptional bargain. Send in your order before this offer expires.

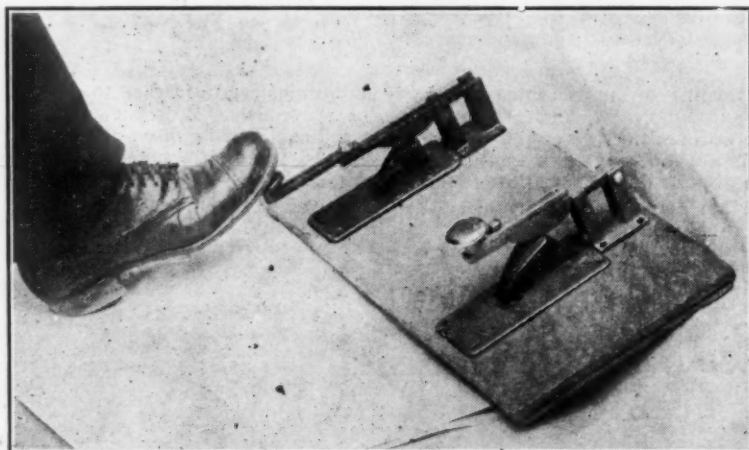
DEALERS Shields Injector is enjoying an unprecedented popularity all over the country. Every car owner in your district is a good and likely prospect.

Write for our unusual proposition.

Wheless-Wilson Auto Supply Co.
SHREVEPORT, LOUISIANA



THE WAGOLA ACCELERATOR EXTENSION IS ADJUSTED TO SUIT THE DRIVER



Many drivers find it hard to reach the accelerator pedal. The Wagola Accelerator Extension solves the problem. It can be attached in five minutes and can be adjusted to suit the driver in a minute. Only four screws used in attaching it.

All drivers have noticed that the accelerator pedal gets hot and makes the foot uncomfortable. The Wagola Accelerator never gets uncomfortably warm.

When not in use it folds back out of the way. There is generally some short person in the family who will certainly appreciate this wonderful little device. Absolutely nothing to break, wear out or get out of order.

PRICE COMPLETE ONLY \$2

If your dealer cannot supply you, send \$2 and you will receive a Wagola Adjustable Accelerator Extension by return mail. Better send now before it slips your mind.

DEALERS AND JOBBERS—Send for particulars of our unusually attractive discounts. There is an enormous demand for such an article as this. It's a money maker for you.

The Wagola Manufacturing Co., 1319 Park St., Flint, Michigan



I EARNED \$220000

IN FOUR MONTHS

This Is Richard A. Oldham

Mr. Oldham was telegraph operator for the Illinois Central Railroad for twenty years. He is fifty-eight years old. During all those twenty years, he drew the customary monthly salary of a telegraph operator—no more—no less. One day he read one of my advertisements and the possibilities of making money in the Auto Tire Repair Business. In a few weeks he had purchased and installed a Haywood outfit, and was doing business for himself. He was **His Own Boss**. A short time ago he wrote us that his income in four months was as much as it had been in Two and One-Half Years as Telegraph Operator. You men who have been left at home—who are beyond the draft age, can and must take up the burdens left behind by others. Oldham is a living example of what can be done. I have 500 places to be filled now. 500 stations where tire repairing is neglected, because there is no one to do it.

I Must Have 500 Men to fill these places within the next sixty days

I have a big interesting book to send you—a book about tires—it explains this business—gives inside figures and profit. Gives actual proof of success—letters of others who are now operating Haywood Shops and making big money. What these men have done you can do. \$2,500 to \$4,000 a year is conservative. One machine will give you a start. You can see business all around you—everywhere there are automobiles there are tires that need repairing. You know that. All you do is open a shop—put out a Haywood sign, and auto owners will come to you and the service you bring them.

Sign the coupon and mail it today, or send a post card or letter.

HAYWOOD TIRE & EQUIPMENT CO.
M. HAYWOOD, President 501 Capitol Avenue, INDIANAPOLIS



M. HAYWOOD, Pres.
HAYWOOD TIRE & EQUIPMENT CO.
501 Capitol Avenue, Indianapolis, Ind.

Dear Sir: Please send me your book on Haywood Tire Repair Plants and full particulars on your National Tire Repair Service and details of your FREE school of tire repairing.

Name
Address
.....

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HERE'S FUN FOR YOU!

A day in the woods with a HAWKEYE Basket! Fish, hike, smoke, read and rest in the woods and take along the eatables and drinkables in a

Hawkeye BASKET REFRIGERATOR

the wonderful woven reed basket with the nickel-plated interior that keeps food and drink cool, clean and fresh for thirty-six hours—all from a small lump of ice placed in the ice compartment

of the basket. Practical, handsome, light weight and cleanly. The HAWKEYE Basket refrigerator has been the keynote of hundreds of enjoyable "days in the woods." Price \$5.00 and up.

BURLINGTON BASKET CO., 216 Hawkeye Bldg., Dept. Q, Burlington, Iowa

Try a HAWKEYE Basket—30 days without expense—that's how good they are. Ask for booklet 32

WE WANT MORE DEALERS



JEWELL BATTERY GAUGE

The Ever Watchful Guardian of Your Battery

The most delicate and sensitive part of a car is the storage battery.

If it is not kept fully charged,

If the water is allowed to run low,

If it is subjected to a heavy discharge, such as using the starter under either of above conditions,

If there is a short circuit anywhere or a multitude of other troubles liable to arise at any moment, disaster and expense is avoidable only by immediate action.

The JEWELL BATTERY GAUGE gives you ample warning to take such action.

A semi-monthly inspection and hydrometer test is like a fire alarm that would ring only after your house was in ashes.

The JEWELL is on the job all the time and tells you at a glance, not in technical terms but in plain English, the exact condition of your battery and what to do.

Can be installed by any one in a few minutes and requires no change in or interference with the wiring system.

A Time, Trouble and Money Saver for the car owner; and a gold mine for the dealer, as every car owner who sees will buy.

Manufactured by
Jewell Electrical Instrument Co.
1646 W. Walnut St., Chicago

Exclusive Sales Representatives
Gray-Heath Company
1440 Michigan Ave., Chicago



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SHIELD YOUR CAR
Front and Rear with

**HALLADAY
BUMPERS**

Have you ever realized the foolishness of leaving a car worth from \$1,000 to \$5,000 standing unprotected on the street or constantly subject to serious damage while traveling, when a small investment in

HALLADAY BUMPERS

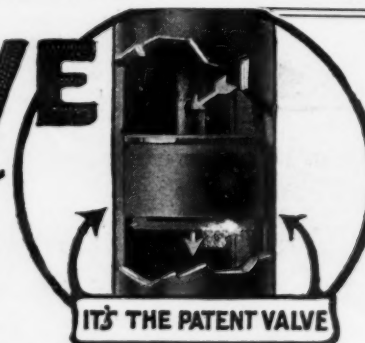
would eliminate 90 per cent of the danger?

See your Dealer today and demand HALLADAYS for Maximum Safety

HALLADAY MFG. COMPANY, Streator, Illinois

SEE THIS VALVE

It makes Pumping
Easy and Sure



Sure Sales

Sure Profits

Sure Satisfaction

THIS VALVE is fully covered by U. S. and foreign patents, which in addition to its Super-durability, makes THE ROSE TIRE PUMP stand out pre-eminently alone on the market as the only TRULY SATISFACTORY TIRE PUMP.

JOBBERs: Most of you handle Rose Pumps and know this is true. If you are one that does not, you are the loser.

DEALERs: If you are not next to this Big Seller, we will send you a sample at 'regular dealers' price, transportation prepaid, with the privilege of returning it at our expense if not interested.

USERs: Demand a ROSE PUMP and end your inflation trouble forever.

J. H. HANEY & CO. Hastings, Nebraska

Manufacturers
ROSE TIRE PUMPS AND GREASE GUNS



When Writing to Advertisers, Please Mention Motor Age

*Showing wheel
fully tilted
and locked*



NOW COMES THE SUPERIOR LOCK FOR FORDS

The Warner Wheel-Tilt Lock is the latest improvement in the Ford lock field. It absolutely locks the steering apparatus in a way that prevents theft—because a Ford that cannot be steered cannot be stolen.

The wheel can be tilted and is entirely out of the way when one is entering or leaving the car. A light pull of the latch tilts the wheel instantly. A turn of the key locks the steering wheel rigidly in tilted position. The car is then safe from thieves.

WARNER WHEEL-TILT LOCK

The original Ford steering wheel is used—there are no extra parts to buy and no complicated mechanism to get out of order. Simple in operation—simple in construction.

Can be installed by anyone in fifteen minutes with a screw driver and wrench.

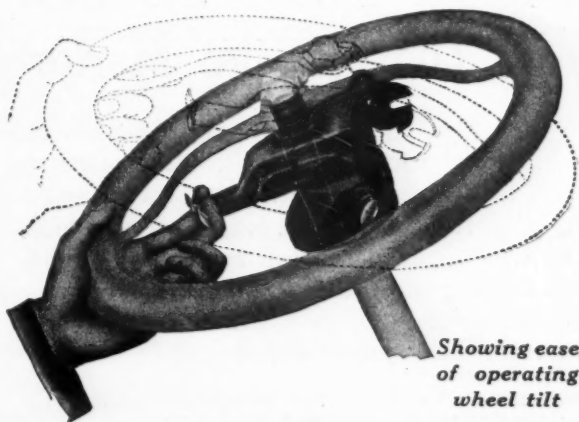
PRICE COMPLETE **\$7** NO EXTRAS TO BUY

The Warner Wheel-Tilt is the surest and safest method of locking Fords. If your Ford is Warner equipped you need never worry that some prowling thief will make off with it.

Dealers—This is the most efficient and highly developed Ford lock yet produced. Cash in on the tremendous success that awaits it.

Send for our attractive proposition

Warner Electric Company
MUNCIE, INDIANA



*Showing ease
of operating
wheel tilt*



The Curtis Sign

Illustrated above—is 10x14 inches—baked enamel on steel. Cannot be bought, but is furnished FREE with every CURTIS Garage Air Compressor—and cannot be had in any other way.

Install a Curtis Air Compressor

Display a CURTIS "FREE AIR" SIGN above your door—it inspires confidence and will help build your business. Motorists are looking for this familiar CURTIS slogan—because they know oil rots tires—and that a CURTIS Air Compressor furnishes AIR FREE FROM OIL, which means fewer blowouts, greater tire mileage and less repairs. The CURTIS is the ONLY Garage Air Compressor with the controlled splash oiling system that eliminates all danger of forcing oil into the air line.

CURTIS AIR FREE FROM OIL

Investigate the many exclusive features of CURTIS Garage Air Compressors. The line is complete—five sizes—stationary or portable. Just write your name and address on the margin of this advertisement—tear it out and send it to your jobber, or to us direct, for complete information and prices.

Curtis Pneumatic Machinery Co.

1527 Kienlen Ave., St. Louis, Mo.

Branch Office—530-H Hudson Terminal, New York City



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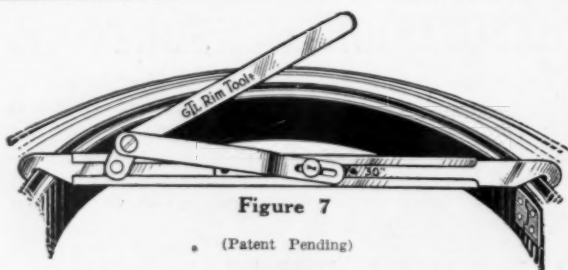


Figure 7

(Patent Pending)

TGL

Without Doubt the Best Rim Tool on the Market

The T. G. L. Rim Tool is built the way a rim tool should be built. Its construction is simple and permits great strength in all parts. It operates in a **logical**, sensible way—one operation removes the rim. No fussing around with bolts or handles—no adjustments—one movement of the lever and the job is done.

The T. G. L. is the simplest, most efficient and most satisfactory rim tool on the market today.

It Has Become Standard

The T. G. L. Rim Tool is known everywhere as the standard tool. Once it is seen in operation it is acknowledged as the superior way of removing tires.

No pounding, pulling or forcing tires on and off. No danger of pinched tubes or damaged casings. No lost time—no inconvenience.

With the T. G. L. a tire is removed in a fraction of the time that it required in the old way.

Remove the rim from the tire instead of forcing the tire from the rim.

DEALERS: If your jobber cannot supply you, write to us direct.

JOBBER: We have an unusually attractive proposition to offer. Write for details.

Metal Products Mfg. Co.

2416 University Avenue, S. E.

MINNEAPOLIS

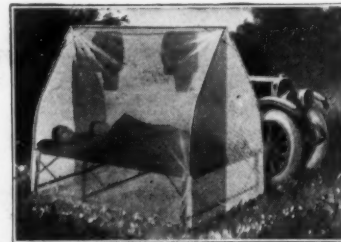
MINN.



TENTOBED



TENTOBED rolled up in dust and water proof wrapper



Automobile tourists, campers and all outdoor folk find the Tentobed the ideal outdoor sleeping arrangement. Light, portable, compact—no stakes, ropes or poles required; positively water, mildew, mosquito and insect proof.

Folds up so compact that two of them may easily be carried on the running board of any automobile or conveniently packed in a canoe. Can be set up anywhere in five minutes and is entirely self-supporting. Complete in every particular and as comfortable as any bed made. Accommodates 2 full grown persons without crowding.

It is 4 ft. wide and 6 ft. 4 in. long—extra large bed for two adults; weight 45 lbs. Complete outfit rolls into package 4 ft. long by 7 in. in diameter. For sale by reliable dealers.

Write for descriptive circular

TENTOBED COMPANY

3427 W. Lake Street

CHICAGO, ILLINOIS

WIRE WHEELS

HOUSE TYPE

for 150 makes of cars.
Write for full information and prices on wire wheels for any make or model of car.

DEALERS!

Wire Wheels are *sellors!* Get particulars of wire wheel service and sales agent's propositions.

Ford distributors and accessory dealers should write for special service and sales proposition for HOUSE type Wire Wheels for Ford cars.

Wire Wheel Corporation of America
(Successors to Houk Mfg. Co.)

835 Eleventh Ave., at 57th St., New York

HOUSE TYPE for Fords

List price for sets of 5 wire wheels, 4 inner hubs, 4 hub caps, hub cap wrench, spoke nipple wrench, 1 hub dust cover for spare wheel, \$60. White, black, red. Color optional.



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The Most Remarkable Top Material Yet Produced

There is one thing about DRIDEK. It is always just the same! Every piece—every yard—has that same perfect finish that will not scratch or blister.

When you want a fine, snappy top; or attractive, soft upholstery—buy a car that is trimmed with DRIDEK. Absolutely waterproof, and will not scratch or blister.

DRIDEK Tops turn out well, and are a source of continuous satisfaction to the car owner.

*Send to Dept. C
for Samples and
prices of DRIDEK*

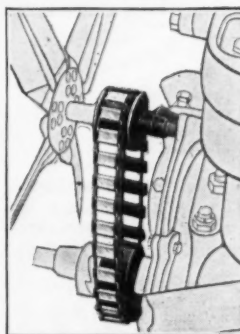
L. J. MUTTY CO.
BOSTON, MASS.



Stop Overheating Your Motor!

Are you sure your motor is being properly cooled these hot days? Is your fan speed slow and irregular? You can rest assured that your motor is being cooled properly if you have an efficient fan belt—a fan belt which will not stretch or break—which drives the fan at full speed—at all times. Put a

CROWE MECHANICAL FAN BELT



on your car. It is a flexible steel chain belt with a leather friction surface of best oak-tanned sole leather which will not stretch or break. Instantly adjustable. Oil, water and dirt-proof. The "Crowe Belt" runs on the same pulleys as your old belt.

The leather friction blocks grip the pulleys tight and drive your fan at full speed. The steel chain insures a strength which is found in no other fan belt.

15,000 MILE GUARANTEE

Each Crowe Mechanical Fan Belt receives the manufacturers' guarantee for 15,000 miles. This guarantee applies to Fords and other pleasure cars. Proportionate mileage guarantee for trucks, tractors and tractor attachments.

Dealers Everywhere Get a "Crowe Belt" for your car from any dealer. Instantly adjustable to any Ford model, \$1.25 (Canada, \$1.50). Apply for prices of belts for other cars. Shipped prepaid where we have no dealer. If your dealer hasn't a Crowe Mechanical Fan Belt for your car—write us. Give us name, model and year of your car.

Dealers: write any one of these distributors of "Crowe Belts":
 Gray-Heath Company, 1440 Michigan Ave., Chicago
 J. J. Moran & Son, 606 Oriol Bldg., St. Louis, Mo.
 E. L. Thompson Co., 817 Boylston St., Boston, Mass.
 Geo. L. Holmes, 1733 Broadway, New York, N. Y.
 Jno. J. Wirtner, 605 Wells-Fargo Bldg., San Francisco
 Norman Cowan, 433 Rialto Building, San Francisco
 Moran & McMenamy, 1424 So. Main St., Los Angeles

Mechanical Belt Company

1207 Frederick Avenue

St. Joseph, Mo., U.S.A.

The Swan Fan Belt Adjuster automatically regulates the tension of any Ford Fan Belt. Convenient, durable and economical. Price 35c. (Canada 50c).

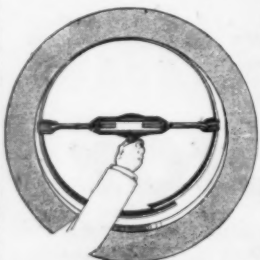
THERE IS NO OTHER TOOL LIKE IT!



UTILITY RIM REMOVER

Built on an entirely new and greatly improved principle. The Utility grips both sides of rim at the center, thus distributing strain evenly over entire rim. A few turns of the turn-buckle cause a gradual, uniform contraction of the rim. There is no sudden jerk or strain to twist the rim out of shape.

There is no other rim remover that operates like the Utility. One universal size fits all sizes and styles of rims. No prying—no pounding—no hammering—no pinched tubes. The work is done quickly and safely. The Utility operates without any possibility of danger to either rim or casing. \$3.00 f. o. b. Chicago.



DEALERS—If your Jobber can't supply you write

R. P. HARTENSTEIN
Manufacturer Metal Specialties
542 S. Dearborn St., Chicago



Beauty of Glass a Factor in Selling Cars

Manufacturers of automobiles realize the value of beauty as a sales factor. Consequently they demand glass of high quality—at a reasonable price.

Crystal Sheet Glass, while considerably less expensive than plate, possesses every element of beauty and quality essential to high grade automobile construction.

It is strong, uniform in thickness, perfectly transparent, and of the proper degree of flexibility.

Ask us to explain in detail why Crystal Sheet is the logical glass for your cars.

AMERICAN WINDOW GLASS CO.
World's Largest Producer
GENERAL OFFICES: FARMERS' BANK BLDG.
Pittsburgh, Pa., U. S. A.

THE PERFECT GEAR LUBRICANT



For Transmissions
And Differentials

Ever-Lastin will not run in hottest weather—will not freeze in coldest weather—sticks to metal under the worst strains and pressure—preventing wear and assuring perfect lubrication.

Ever-Lastin TRADE MARK
GEAR COMPOUND

Less Required—Lasts Longer

It is only necessary to use one third the quantity of *Ever-Lastin* that you would oil or grease—and will last three or four times as long. Comes in 5, 10, 25 and 50-lb. tins—also in 225 and 400-lb. barrels.

FREE TO DEALERS With first order for half or full barrel of *Ever-Lastin*, we will send a self measuring 20-lb. grease cabinet free—pumps $\frac{1}{4}$ -lb. to the stroke.

You will find *Ever-Lastin* a big money maker—write us today for prices and full particulars.

IMPERIAL OIL CO.
3146 Locust St. St. Louis, Mo.



At Our Risk— You Can Prove It

Don't waste good money on tire pumps that either break your back, or pump **Rubber Rotting** oil particles or gasoline fumes into your tires.

Take No Chances

At our risk you can prove that the "Dead Easy" is quicker, safer, easier and cheaper than any other tire pump, either engine drive or hand power. Convenient to carry with any car, it is always ready for instant service. The gauge showing exact tire pressure, there is no guesswork—and it's "Dead Easy."



FREE TRIAL OFFER

Write today, NOW, for fifteen day—no money-in-advance—free trial offer.

GLOBE MANUFACTURING CO.
BATTLE CREEK :: :: MICHIGAN U. S. A.

The Hollenden Cleveland

"Home of the Cleveland Auto Club"

QUIET elegance, dignity and refinement are expressed throughout in Hollenden appointments, and reflected in Hollenden patronage.

The Hollenden is known as Cleveland's most exclusive hotel.

EUROPEAN PLAN — WITH BATH:

For One Person \$2 to \$5

For Two Persons \$3 to \$6

With Twin Beds \$4 to \$6

Suites at Various Prices

Ample garage facilities immediately adjacent

Official A. A. A. Hotel



WHEREVER a real truck is demanded, the Oneida has earned the right of first consideration.

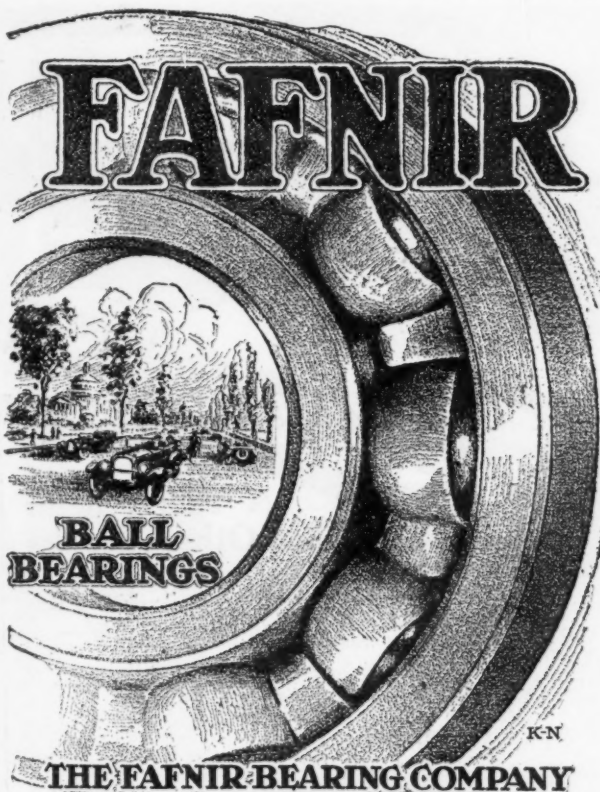
Designed by engineering skill second to none, powered to meet every emergency of load and road, it stands as a great achievement in the motor truck world. Dealers: Write or wire. Your territory may still be open. 1, 1½, 2, 3½ and 5 ton models. All worm drive.

PROMPT DELIVERIES!

Oneida Motor Truck Co. FACTORIES:
GREEN BAY, WIS.

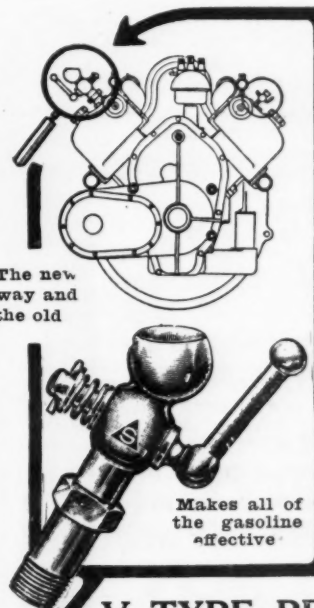
ONEIDA

MOTOR TRUCKS



THE FAFNIR-BEARING COMPANY

Conrad Patent License
Main Office and Factory: New Britain, Conn.
Detroit Office: 752 David Whitney Bldg. Chicago Office: 1909 So. Michigan Ave.



The new
way and
the old

Makes all of
the gasoline
effective

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THE Stevens V Type Priming Cup is built for the V type motors. Slanted at just the right angle—it holds all the gasoline, making every drop effective.

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These cups are so much better than other types that they should be carried in stock and sold by every dealer and garageman. Place your order today.

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Keeps Spark Plugs, Valves, Pistons and Cylinders free from carbon—all the time.

Don't let your engine choke up with carbon until it can't run, and then remove it—**Prevent it!**

Put Ohio Karbon Killer in your gasoline, and prevent the formation of carbon, thus keeping your engine in the very best condition at all times.

Costs \$1.00 per lb., and a pound treats 480 gallons of gas. Get a can right now, and give your engine a chance. If your dealer cannot supply you, send your dollar to

THE OHIO GREASE COMPANY
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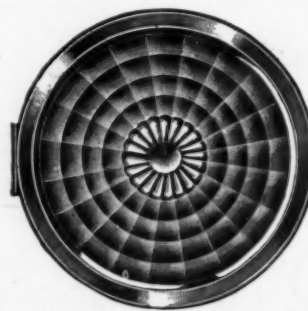
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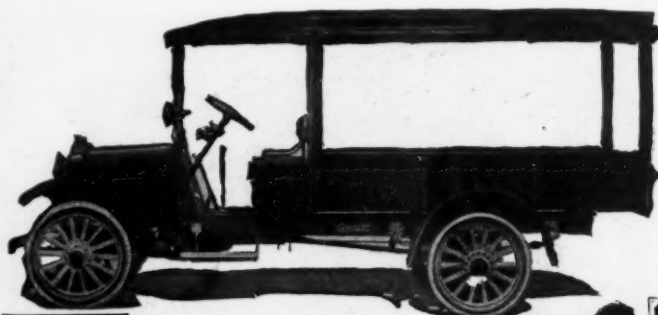
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Inches	Per Pair
6 to 8½ diameter..	\$1.50
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We are prepared to fill all orders promptly. Write or wire for our interesting proposition.

We operate our own big factory

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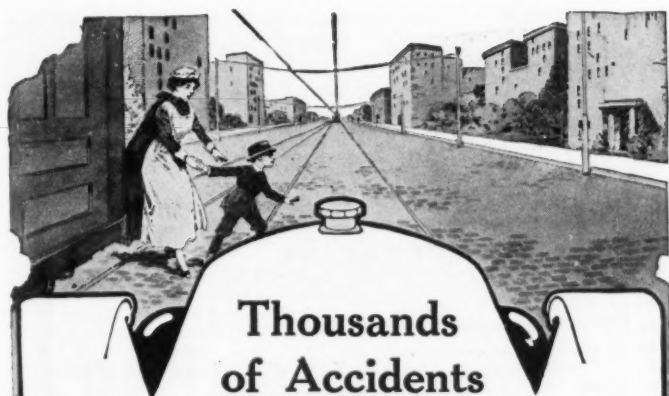
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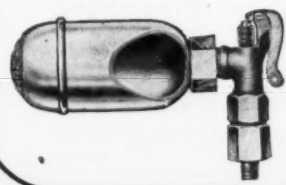
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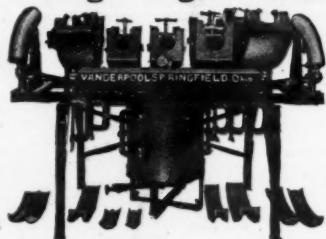
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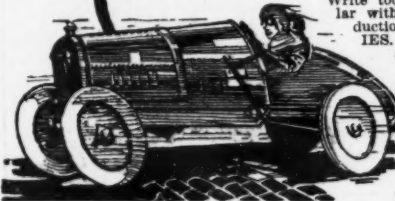
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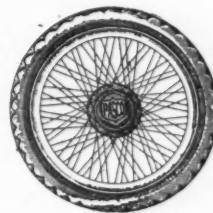
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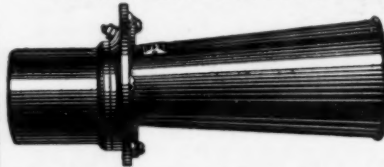
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No hump. No hole.

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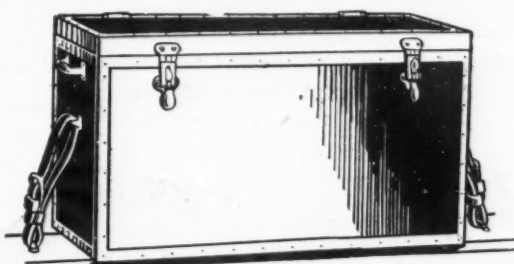
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Write and ask us how we do it. They are positively not seconds, but first-class fresh casings. The following are dealers' prices:

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30x3 1/2	4.00	6.00	7.25
32x3 1/2	4.25	7.25	9.00
32x4	4.50	7.75	9.50
33x4	4.75	8.00	10.00
34x4	5.25	8.25	10.25
36x4	5.50	8.50	10.50
38x4	5.75	8.75	11.00
34x4 1/2	5.75	9.00	11.50
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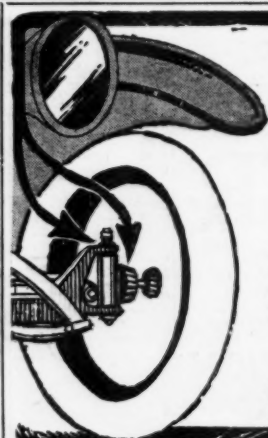
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REGISTERED IN
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Covered
Complete

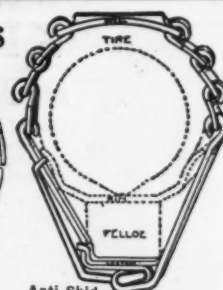


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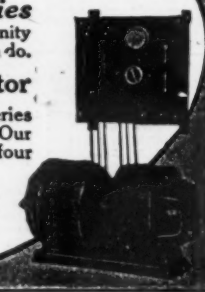
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Our 3-G Motor Generator

charges from one to eight 6-volt batteries at one time. Anyone can operate it. Our 9-G Generator charges one to twenty-four batteries at a time.

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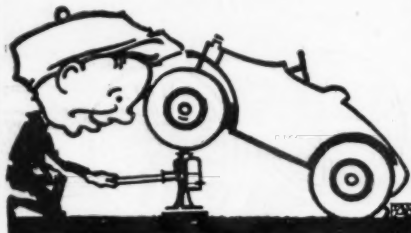
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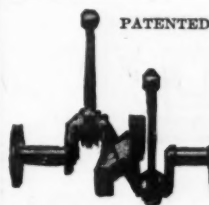
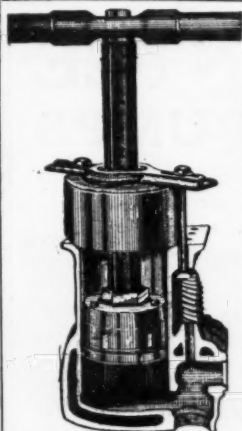
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Equally necessary on Racing Fords, passenger models, delivery cars and tractors. They add enough to life of the motor to pay for themselves quick. They positively give more speed, more power, greater economy. More than 1000 Fords are now equipped, and every user satisfied. More than half of the orders received are repeat orders, coming from those who have tried them and know. Installed with a wrench.

Big Ready Sellers. Price \$12.00 per Set.

Liberal Discount for Dealers and Jobbers.

Write for our proposition and free illustrated literature

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1220 San Pedro Street Los Angeles, Cal.

The VACUUM MUFFLER

*INCREASES
ENGINE
POWER*

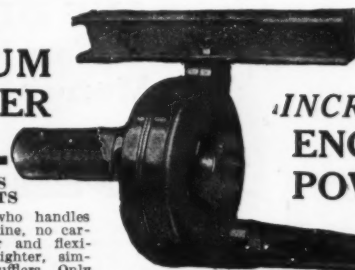
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assured Dealer who handles this. Saves gasoline, no carbon, adds power and flexibility. Lighter, tighter, simpler than other mufflers. Only 2 castings, joined by 3 bolts.

Guaranteed Against Blowouts

Write at once for full particulars and generous discounts. This muffler has been proved by car owners in actual service. Never out of order and outlasts the car.

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For Ford, Saxon, Scripps-Booth; 1½ in. outside diameter.
For Maxwell 1½ in. outside diam.
For Allen, Grant, Harroun, Oldsmobile, Briscoe and 1918 Saxon, 1½ in. outside diameter.
Other cars in proportion.

GOOD TIRES AT CUT RATE PRICES

High grade, firsts—not seconds, not blemished or rejected tires, but good tires; tires that will bring every user back for more. Sold without guarantee.

RIBBED TIRES

At these prices are the biggest bargains you ever purchased in your life—Think of it!

Non-Skid Tubes		Non-Skid Tubes	
30x3.....	\$ 8.00	32x4.....	\$16.10
30x3½.....	10.25	33x4.....	16.80
32x3½.....	12.00	34x4.....	17.25

Write now for dealers' proposition, or better yet, rush in a trial order with Chicago or New York draft, express or P. O. money order. If you prefer, send 20% of amount with your order and we'll ship goods C. O. D., subject to examination. Investigate this now. Let us tell you how we can do it.

BUDRICK RUBBER CO.

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Winton Six

If the car you have is not your ideal, insure your peace of mind and your happiness once for all by placing your order for a Winton Six. Write today for catalog.

THE WINTON COMPANY

424 Berea, Road, Cleveland, Ohio, U. S. A.

The "Big Stick" That Brings Down Gasoline Expense

Up goes the price of gasoline! Maximum mileage is the big problem of the day! Solve it with the new Stromberg Carburetor.



New STROMBERG Does it!
CARBURETOR

The Official world's records made by the New Stromberg in gasoline mileage prove that you need the New Stromberg on your car. Mail coupon for details of how the New Stromberg will reduce your gasoline bills.
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KINGSTON CARBURETOR

Save Money by Economizing Gasoline

Four floating, bronze ball valves opening automatically under different motor suction supply a uniform mixture at any speed regardless of hot, cold, wet or dry weather.

Write for details and let us tell you why so many manufacturers are adopting this carburetor as standard equipment.

**MADE BY THE OLDEST MANUFACTURERS OF CARBURETORS
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ESTABLISHED 1895

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ELECTRIC STARTING & LIGHTING SYSTEM for FORD Cars

The way absolute dependability has been achieved in this system is by building over 95 per cent of it in our own plant, where we can watch every operation and know it is right.

\$95.00 Completely Installed

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Larrabee Trucks are built for heavy duty and will stand up under most exacting conditions. Capacity 1 ton and up. Worm drive. Write for specifications.



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Fast service, full measure and perfectly filtered gasoline, assure dealers the constant patronage of satisfied customers.

Write for the Pump Book

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HOT SHOT MANIFOLD for Ford Cars

The intake and exhaust manifold is cast in one piece with a thin wall separating them. Thus the heat fully vaporizes the gasoline which gives a hot, powerful explosion.

The Hot Shot Manifold eliminates carbon and oily spark plugs; reduces engine trouble; saves 25 to 50 per cent of gasoline consumption; fully vaporizes all grades of "gas;" designed by engineers and indorsed by automotive engineers.

At the rate of 3 gallons of gasoline per day, this manifold will pay for itself every 40 days. Money will be refunded in 10 days if the Hot Shot Manifold does not come up to all claims made for it.

Dealers and jobbers write

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The most attractive and most popular Radiator Ornament ever produced. Fits any car, indestructible, solid aluminum, highly polished, wings hand-painted with flying emblem in red, white and blue. The slightest motion spins propeller arm, and makes it almost seem alive. "It fairly hums with patriotism."

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A 1-INCH FIRING SURFACE

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THIS name on any tire insures greatest satisfaction. The exactness of construction and the quality of materials have made Firestone the biggest word in tire building.

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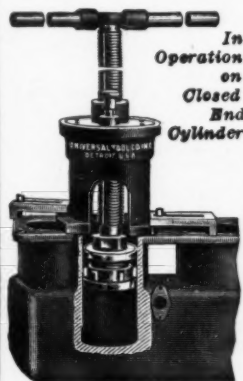
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Prompt deliveries of all capacities. Quality, price and demand insure good business. Write for our proposition
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The New Improved Universal Cylinder Reboring Tool Is Mistake Proof

As simple in design as it is effective in action. Construction insures an absolutely rigid tool, with perfect centering device. Other new and revolutionary improvements that make cylinder reboring easy for any one to do.

Range of Expansion 2½"-5 1/16"

Write for free illustrated literature with complete details. Give Jobber's name.

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STARTING-LIGHTING SYSTEMS

THE DYNETO shows greatest efficiency in both motor and generator. Type D. A. Motor develops a torque of approximately 15 pounds. Type C. A. Generator shows approximately 15 amperes.

A car-speed of 15 to 20 M. P. H. keeps batteries fully charged.

Starter always sure to start. Lamps always bright.

Send drawings and specifications for our recommendation.

Special Outfits for Fords

DYNETO ELECTRIC CORPORATION, Syracuse, N. Y.



Immediate shipment, VULCAN seven leaf, heavy, oil tempered, fronts for the Ford. 588 other types, 90,000 springs in stock. Liberal discounts.

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Factory and General Offices, Richmond, Indiana
Branches with full stocks

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Reading, Pa.	- - -	538 Franklin Street
Sumter, S. C.	- - -	29 Caldwell Street

MR. DEALER

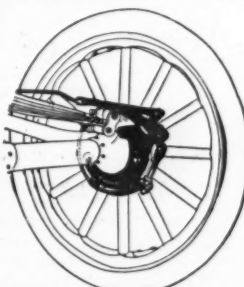
This morning's mail (April 8th) brought in repeat orders from Dealers for 109 sets PLA-SAFE Emergency Brakes.

These dealers were not influenced to place these orders by clever salesmen or glaring advertisements, but have found that our Brake has merit, and when a few sets are placed on owners' cars, that an instant demand results.

Why not write us today for our Disc. and Big Selling Plan?

PLA-SAFE COMPANY

Successors to L. A. Leathers Co.
BROOKVILLE PENNSYLVANIA



Retail Price \$10 Set

Long Life Bushings In Spite of Neglect

Oil-less Bushings

"NIGRUM" (Impregnated Wood) "BOUND BROOK" (Graphite-and-Bronze)

Trade Mark Reg. U. S. Pat. Off.

All genuine Graphited Oil-less Bushings have always been made at Bound Brook, U. S. A.

BOUND BROOK OIL-LESS BEARING CO.

Bound Brook New Jersey

Specialists in the manufacture of Oil-less Bushings for more than a third of a Century

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AMERICA'S SUPREME IGNITION SYSTEM

NEW YORK, CHICAGO, DETROIT, SAN FRANCISCO
WORKS AND FOUNDRIES: SPRINGFIELD, MASS.

THE CLEARING HOUSE

OF THE MOTOR INDUSTRY

FOR PARTS, ACCESSORIES, TIRES, MACHINERY, REBUILDING, REPAIRING, WELDING AND USED CARS.
ALSO HELP AND SITUATIONS WANTED AND MISCELLANEOUS CLASSIFIED ADVERTISING

This Bargain List for Quick Buyers

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R. C. H.	\$ 40.00
Metz 1914	50.00
Flanders 20	50.00
E. M. F.	50.00
Studebaker 25	50.00
Studebaker 35	65.00
Studebaker 4, 1915	65.00
Studebaker 6	100.00
Overland model 75	75.00
Overland model 90	75.00
Overland and 6 cylinder	
Continental	100.00
Peerless 45 H. P.	50.00
Partin Palmer	50.00
Firestone Columbus	60.00
Mitchell 4, 1916	50.00
Mitchell 4-40, 1914	75.00
Stoddard Dayton, 30	
H. P.	60.00
Stoddard Dayton, 45	
H. P.	75.00
Case 1911	75.00
Cadillac 1912	75.00
Moon 1912	75.00
Speedwell 40 H. P.	75.00
Stearns 1911	75.00
Henderson 4 cyl. 1915	75.00
Buick 19	85.00
Buick 17	90.00
Locomobile 1910	90.00
Vellie 40, 1912	85.00
Vellie 4, 1915, Starter & Generator	125.00
Apperson 8 cyl.	150.00

UNIT PLANTS

Jackson 35	\$ 75.00
Menominee Truck	100.00
King 1914	100.00

Maxwell 1916	125.00
Imperial 1916, Continental Motor	125.00
Eclair 1916	125.00
Allen 1916	125.00
Paige 6 cyl.	175.00
Buick 6, 1916	200.00
Drummond 8, Spillman Motor	200.00
Cadillac 8, 1916	300.00

ARE GUARANTEED IN GOOD SHAPE

STARTERS

Gray & Davis, Overland, 79	\$20.00
Gray & Davis, Maxwell 15	17.50
Gray & Davis, Vellie 14-15	20.00
Gray & Davis, Lozier	22.50
Remy, Auburn 6-38, like new	20.00
Remy, Mitchell 14, 4 & 6	15.00
Remy Starter & Generator & Distributor, 12 Volt	25.00
Ward-Leonard, Moline	
Dreadnaught	15.00
Ward-Leonard, Type B, L-D, C	17.50
Auto Lite, Overland 80	12.50
81, 83	12.50
1914 6 cyl. Jackson 1914	12.50
Auto Lite, Paterson	12.50
Wagner, Studebaker 15	17.50
Entz, Starter & Generator, 18 volt, Chalmers	35.00
Westinghouse, Lexington, 20.00	
Bosch Fly Wheel type S202, less fly wheel gear ring	25.00
Delco Single Unit Starter	30.00

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We Guarantee Every Part to Be Exactly as Represented or We Will Promptly Refund the Price You Paid Highest Banking References

GENERATORS

Gray & Davis, Master Six Chalmers	\$20.00
Gray & Davis, New, with cutout, Chalmers	20.00
Gray & Davis, Single Unit Ford Starter and Generator, with clutch for use on Generator only	17.50
Ward-Leonard, New	15.00
Remy, Reo 1915, complete with coil	45.00
Remy, Auburn 6-38, complete, less coil	30.00
Vesta	12.50
Beardon	12.50
Apple	12.50
Esckridge	12.50

MAGNETOS

Simms, H. T.	\$15.00
Splitdorf Dixie	20.00
Mea	25.00
Eisman G-4	25.00
Bosch d-4	17.50
Bosch N-U-4	20.00
Bosch D-R-4	25.00
Bosch D-U-4, Set Spark	25.00
Bosch D-U-4	30.00
Bosch D-6	25.00
Bosch D-U-6 and D-R-6	35.00
Bosch Z-R-6 and coil	50.00

Rear Axles	\$25.00 to \$50.00
Radiators	10.00 to 20.00
Front Axles	5.00 to 15.00
Transmissions	25.00 to 50.00
Carburetors	5.00 to 15.00
Bearings	.50 to 5.00
Springs	1.50 to 2.50
Spring Leaves	.25 to .50
Gears	1.50 to 15.00
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Gasoline Tanks	1.50 to 7.50
Reliners	.75 to 1.50
Patches	.15 to .50
Lamps	.50 to 5.00
Windshields	6.00 to 10.00
Spot Lights	2.00 to 3.50
Jacks	1.05 to 8.75
Rims	1.50 to 2.50
Presto Light Tanks	5.00 to 6.00
Search Light Tanks	3.00 to 4.00
Splitdorf Dash Coils	7.50
Stewart Vacuum Tanks	7.50
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AUTO WRECKING CO. 13th and Oak Kansas City, Mo.

Rapid Fire Service and Lowest Prices ON GOOD SERVICEABLE PARTS FOR ALL CARS

If We Cannot Satisfy You, Money Cheerfully Refunded

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All in excellent condition	
4 cyl. 1914 Mitchell	\$100.00
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4 cyl. Oldsmobile (Autocrat model)	150.00
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1912 36 Pierce Arrow	125.00
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4 cyl. 1914 Moon with starter	100.00
4 cyl. 1913 Buda	85.00
1913 Atlas	75.00
6 cyl. 50 H. P. Rider-Lewis (fine for boat)	100.00
1914 Marmon	100.00
1915 Kirt	65.00
83 Overland with starter	85.00
6 cyl. 1914 Jeffery with starter and generator	125.00
6 cyl. Everitt	85.00

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4 cyl. Continental—complete	\$100.00
4 cyl. Milwaukee—complete	100.00
1914 Lozier 6	200.00
1914 Premier with starter	150.00
4 cyl. Chalmers 30	65.00
6 cyl. Stevens-Duryea—complete	150.00
4 cyl. 1913 Abbott-Detroit with starter and generator	150.00

1914 Allen	\$115.00
1917 6 cyl. Regal	100.00
1915 6 cyl. Master Chalmers	150.00
1916 6 cyl. Chalmers 30	125.00
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1914 6 cyl. Oldsmobile	135.00
Buick 35	100.00
1916 Le Roi	65.00
Hupp 20	40.00

Liberal allowance made on your old motor

Cylinder Blocks, Pistons, Shafts, etc., for most all motors

MAGNETOS

Overhauled and Guaranteed	
DU4 Bosch Set Spark	\$18.00
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DR4 Bosch	18.00
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NU4 Bosch	15.00
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Eisemann Dual	15.00
Remy Model RL & D	7.00
Dixie Mags	12.00
We carry in stock all magneto parts	

GENERATORS

Gray & Davis	\$15.00
Ward Leonard	12.00
Remy	12.00
Vesta	18.00
Beardon	12.00
Apple	10.00

STARTERS

Gray & Davis	\$15.00 to \$20.00
Remy	15.00
Ward-Leonard	20.00
Auto Lite, Bendix Drive	25.00
Auto Lite, Gear Drive	20.00
Vagner	25.00
Westinghouse	25.00
Delco	25.00

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Eisemann	4.00
Splitdorf	4.00
Simms, H. T.	12.00
Mea	10.00
Silent Starter and Generator Chains; all lengths and sizes	

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Gray & Davis 12-in. face, two bulb type	\$5.00
Special 12-in. face, two bulb type	4.00
New steering posts	5.00

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\$150.00 to \$550.00

50 to 75 exceptionally good used cars at prices so low that they would even interest dealers.

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All Styles and Makes

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Front Axles	\$5.00 to \$10.00
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Radiators	10.00 to 35.00
Transmissions	15.00 to 100.00
Carburetors	5.00 to 9.00
Bearings	.50 to 3.50
Springs	1.00 to 3.50
Transmission Gears	1.00 to 5.00
Differential Gears	6.00 to 10.00
Axle Shafts	2.00 to 8.00
Gasoline Tanks	1.00 to 5.00
Lamps	.50 to 5.00
Windshields	3.50 to 8.00
Spotlights	3.50
Stewart Vacuum Tanks	4.00
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Largest Car Wreckers in the West

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OFF MANUFACTURERS
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COMPLETE PARTS FOR OVER 200 CARS

REMEMBER WE HAVE IN STOCK ALL OF
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Over 100 in stock at half price or better. All
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A large stock. Fully guaranteed. \$25.00 up.

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Over 250, all types, at less than one-half factory
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Of new quality at less than one-half of old list.
(Keep in mind also that all prices have gone up.)

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Not scored. Unquestionably in fine condition.
We won't ship blocks unless in good condition.

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Both new and old. Over three tons. Always
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A THOUSAND. \$1.00 up. Rims of every kind.

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Two and one-half tons of springs. We can fit
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Unlimited stock of bearings at prices unheard of
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CARBURETORS

An immense stock at less than 50 per cent of
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Over 150 Magnetos. Various styles and makes
at any price from \$3.00 up.

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Positively guaranteed. Fifty per cent discount
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of all kinds. Both new and old. Best of con-
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We save you at least one-half. We rebuild tires
with our own process. Our prices are lower
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Send us a trial order. We guarantee satisfactory
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WAY. Our Guarantee is your protec-
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company it with a remittance sufficient to
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OVER 2,000,000 NEW PARTS
UNDER ONE ROOF

Axle, Transmission and Motor parts, Axle
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For all cars, up.....\$ 3.00
Houk wire wheels, 34x4½, 36x4½, per set
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Wheels for Fords, 30x3, brand new, each.... .75

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Beautiful streamline Maxwell bodies, com-
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Touring type\$35.00
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Late type Packard body, 7-passenger,
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Studebaker, 5 passenger, 1915 type..... 40.00

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These bodies are all brand new and ready for
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6-volt Ward Leonard starting motors.....\$15.00
6-volt Ward Leonard generators..... 15.00
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Connecticut type G lighting switches.... 7.50
Connecticut G. A. coils..... 7.50
Cuna starting switches..... 2.50
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6-volt, 100-hour Exide storage batteries....\$18.50
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6-volt, 80-hour Willard..... 22.00
Battery boxes, up..... 1.00

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Gasoline tanks, all shapes and sizes, up...\$ 1.00
Steering gears, complete, up..... 10.00
Windshields for all cars, up..... 8.00
4 and 6 cyl. motors, up..... 49.50
Frames, will fit most any car, up..... 10.00
Special ratio ring gears for Fords, ratio
4-1 12.00

EXPERT REPAIRING

on all makes of Starters, Generators, Mag-
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mobile. Radiators repaired. Welding done.

HARTFORD SHOCK ABSORBERS

Complete with fixtures to fit the following cars:
Hudson Super-Six, Cadillac 8 cyl. and
Packard. Price per set of four.....\$25.00

Puritan Machine Co.

"All parts for all cars"

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That Our
Double Tread
Tires Save
Those Who
Buy Them
More Than
50%

THOUSANDS OF OUR CUSTOMERS

are expressing their approval by equip-
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derful tires after trying one.

TRY ONE

And You Will Do the Same

Note Our Low Prices

28 by 3.....	\$ 4.15
30 by 3.....	4.75
30 by 3½.....	5.80
32 by 3½.....	6.75
31 by 4.....	6.95
32 by 4.....	7.45
33 by 4.....	7.80
34 by 4½.....	9.65
35 by 4½.....	10.15
36 by 4½.....	10.40
37 by 5.....	11.50

10% more for non-skid

At these prices without a mileage guarantee.

We have devoted our years of ex-
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double tread tire and have the satisfac-
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constructed, stand the test.

Send us a deposit of one dollar to
cover express cost and shipment will be
forwarded immediately with privilege of
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Parts and Repairs.

Parts and Repairs.

SEND YOUR
ORDER TO**"BEE BEE"**FOR ANY
USED PARTS*"The House of Big Bargains"*

Put your car in tip-top condition with "Bee Bee" Service. We can quickly send you used parts for ANY make and model of car. Our immense stock covers an entire city block. Whatever you want, it's here!—carefully selected and ready to give you good, honest service.

SPECIAL MOTOR BARGAINS—All in fine condition, fully guaranteed, \$25 up.

CARBURETORS—All makes. MAGNETOS—All styles, all prices

REAR AXLES, GEARS, ANYTHING—Just name it.

We will be glad to quote prices on any used parts, or will ship immediately for your inspection upon receipt of remittance to cover express charges. All orders are filled with the understanding that if the parts don't make good—"Bee Bee" will! Address

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NEW, REBUILT, REPAIRED

We have a full stock of Wire Wheels, Parts and Tools of all makes. Our plant is specially equipped for rebuilding and repairing on a large scale—which means quickest and best service at lowest prices.

Rebuilt Wheels, 50 to 75 per cent saving.

New Wheels—Rudge-Whitworth, Hayes, Houk, Dunlop & Pasco, etc.

Write your requirements. Ship your repairs.

Wire Wheel Repair Co., Inc.

146 West 55th Street, New York City

ALL PARTS FOR ALL CARS

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No Mileage Guarantee at the Above Prices

American Tire & Vulcanizing Co.

Phone: Calumet 5170
2136 S. MICHIGAN AVE. CHICAGO, ILL.

Tires.

Tires.

Tires.

TIRES

SPECIAL SPECIAL SPECIAL
ECONOMY TO MOTORISTS

Select Your Supply Now for The Season—Slightly Used and Factory Repaired

TIRES and TUBES

A TRIAL WILL CONVINCE YOU

Largest and most complete stock of slightly used tires in all makes for immediate shipment.—NO JUNK.

Size	Tires	Tubes	Size	Tires	Tubes
30x3.....	\$ 4.00	\$1.35	35x4.....	8.00	1.75
30x3½.....	5.00	1.45	36x4.....	8.00	1.75
31x3½.....	5.25	1.50	34x4½.....	8.25	1.75
32x3½.....	5.50	1.50	35x4½.....	8.50	1.80
34x3½.....	6.00	1.60	36x4½.....	8.75	1.85
31x4.....	6.25	1.65	37x4½.....	9.25	1.90
32x4.....	7.00	1.60	35x5.....	9.50	2.00
33x4.....	7.75	1.70	36x5.....	9.50	2.00
34x4.....	7.75	1.70	37x5.....	10.00	2.20

Freight Prepaid on all orders exceeding \$50.00 when check in full accompanies order, otherwise \$1.00 deposit with each tire ordered. Specify style of rim to avoid delay.

Although at the above prices these tires bear no mileage guarantee we will make reasonable adjustments should they prove unsatisfactory. All tires sent in for adjustment must be prepaid.

We also carry a complete stock of new tires

AETNA TIRE & SUPPLY COMPANY

1429 Michigan Avenue

Chicago, Illinois

HIGH GRADE QUALITY TIRES & TUBES

MANUFACTURER'S SURPLUS STOCK. Tires contracted for, but car manufacturers unable to accept deliveries as specified.

ODD LOTS accumulated. Odd sizes disposed of to make room for new stock. FACTORY SECONDS. Rejected because blemished in the moulding and finishing—which does not affect their service but merely compels reduction in price.

Size	Plain	Non-Skid	Tubes	Size	Plain	Non-Skid	Tubes
28x3.....	\$ 8.35	\$ 8.75	\$1.80	34x4.....	\$17.55	\$18.45	\$3.40
30x3.....	7.95	8.55	1.95	36x4.....	18.95	19.60	3.65
30x3½.....	10.35	10.95	2.30	34x4½.....	22.60	24.90	4.15
32x3½.....	11.65	12.90	2.40	35x4½.....	23.60	25.10	4.30
31x4.....	16.15	16.90	3.00	36x4½.....	23.90	26.60	4.40
32x4.....	16.55	17.30	3.05	37x5.....	30.75	31.45	5.30
33x4.....	17.10	17.85	3.25	35x5.....	29.85	31.30	.....

Remember, we warrant each and every casing to give satisfactory service, but do not give any definite mileage guarantee, and any tire purchased from us which should not prove satisfactory under ordinary conditions may be returned to us for prompt adjustment, either by replacing or repairing, at our option.

All tires sent in for consideration must have transportation charges prepaid.
TERMS: We will ship any of our Tires or Tubes C. O. D. subject to inspection. Cash discount of 5% is allowed when remittance in full accompany orders. Save this discount, as upon arrival of shipment you still have the privilege of returning any items which do not come up to expectation for full cash refund.

STERLING TIRE & SUPPLY HOUSE

1355 Michigan Ave.

CHICAGO, ILL.

The Best "Buy" of the Year

Tire dealers are taking immediate advantage of our tremendous purchases of factory surplus stocks that come to us at such low figures that we are enabled to offer them to the trade generally at bed-rock prices. These tires, while not guaranteed, are only slightly blemished and can be retailed at a splendid profit. List:

Size	Plain	Non-Skid	Tube	Size	Plain	Non-Skid	Tube
28x3.....	\$ 8.45	\$ 8.85	\$1.90	35x4.....	\$20.25	\$21.30	\$3.55
30x3.....	8.25	8.55	1.85	36x4.....	20.85	21.85	3.65
30x3½.....	10.55	11.15	2.25	33x4½.....	23.15	24.35	3.75
31x3½.....	11.15	11.80	2.35	34x4½.....	23.95	25.15	3.85
32x3½.....	12.45	13.00	2.40	35x4½.....	25.05	26.25	3.90
34x3½.....	14.55	15.20	2.75	36x4½.....	25.45	26.70	4.05
31x4.....	16.35	17.15	2.95	37x4½.....	29.10	30.55	4.65
32x4.....	16.65	17.45	3.00	35x5.....	28.60	30.00	4.75
33x4.....	17.35	18.25	3.05	36x5.....	33.20	35.00	5.20
34x4.....	17.75	18.70	3.15	37x5.....	30.20	31.80	4.90

Specify if clincher, quick detachable or straight side, plain or non-skid. Shipped C. O. D. or S. D.-B. L. subject to examination, upon receipt of 10% deposit. Discount of 2% allowed if check in full accompanies order.

"The House That Made 'Seconds' Popular."

PRESSMAN
Tire Company302 North Broad Street
PHILADELPHIA, PA.

TUBES

SPECIAL SPECIAL SPECIAL
ECONOMY TO MOTORISTS

Select Your Supply Now for The Season—Slightly Used and Factory Repaired

TIRES and TUBES

A TRIAL WILL CONVINCE YOU

Largest and most complete stock of slightly used tires in all makes for immediate shipment.—NO JUNK.

Size	Tires	Tubes	Size	Tires	Tubes
30x3.....	\$ 4.00	\$1.35	35x4.....	8.00	1.75
30x3½.....	5.00	1.45	36x4.....	8.00	1.75
31x3½.....	5.25	1.50	34x4½.....	8.25	1.75
32x3½.....	5.50	1.50	35x4½.....	8.50	1.80
34x3½.....	6.00	1.60	36x4½.....	8.75	1.85
31x4.....	6.25	1.65	37x4½.....	9.25	1.90
32x4.....	7.00	1.60	35x5.....	9.50	2.00
33x4.....	7.75	1.70	36x5.....	9.50	2.00
34x4.....	7.75	1.70	37x5.....	10.00	2.20

Freight Prepaid on all orders exceeding \$50.00 when check in full accompanies order, otherwise \$1.00 deposit with each tire ordered. Specify style of rim to avoid delay.

Although at the above prices these tires bear no mileage guarantee we will make reasonable adjustments should they prove unsatisfactory. All tires sent in for adjustment must be prepaid.

We also carry a complete stock of new tires

AETNA TIRE & SUPPLY COMPANY

1429 Michigan Avenue

Chicago, Illinois

Slightly Used Tires

STANDARD MAKES—NO JUNK

Size	Tire	Size	Tire
30x3.....	\$4.00	36x4.....	\$ 8.25
30x3½.....	4.70	34x4½.....	8.25
32x3½.....	5.70	35x4½.....	8.25
31x4.....	6.20	36x4½.....	8.50
32x4.....	6.75	37x4½.....	9.25
33x4.....	7.00	35x5.....	9.00
34x4.....	7.50	36x5.....	9.00
35x4.....	8.00	37x5.....	10.00

—No mileage guarantee at above prices—
Specify whether Q. D., Clincher or Straight Side
\$1.00 Deposit Required on Each Order, Balance
C. O. D., Subject to ExaminationDelco Tire and Vulcanizing
Company

1545 S. Mich. Ave. Ph. Calumet 4858 Chicago

TIRES

Factory Blemished ALL STANDARD MAKES

No mileage guarantee.

Order from Us and Save Money
Money Back if Not Satisfied

Size	Plain	Non-Skid	Size	Plain	Non-Skid
30x3.....	\$ 8.25	\$ 9.25	34x4.....	\$18.50	\$20.50
30x3½.....	10.75	12.50	34x4½.....	23.50	26.00
32x3½.....	12.25	13.50	35x4½.....	25.00	27.50
31x4.....	15.80	18.50	36x4½.....	29.00	31.00
32x4.....	16.75	19.25	35x5.....	29.00	31.00
33x4.....	17.75	19.75	37x5.....	30.00	32.50

Other sizes in proportion.

Special Prices on Tubes Tires Sent Anywhere
10% with order, balance C. O. D., subject to inspection
THE OHIO GUARANTEE TIRE
& RUBBER CO.

5510 Euclid Ave. CLEVELAND, OHIO

(Dealers wanted)

\$100,000.00 STOCK

STANDARD MAKE FACTORY
SECONDS AT GREATLY REDUCED PRICES

Tires & Tubes

SPECIAL PRICES TO DEALERS ON
QUANTITY ORDERS

No mileage guarantee

SERLIN TIRE CO.

1300-1302 Michigan Ave.

Chicago

Special Bargains in Used Tires

Best Values Ever Offered for the Money

Size	Used Tires	Size	Used Tires
30x3.....	\$ 4.00	36x4.....	\$ 8.00
30x3½.....	4.75	34x4½.....	8.00
32x3½.....	5.75	35x4½.....	8.00
31x4.....	6.25	36x4½.....	8.50
32x4.....	6.50	37x4½.....	9.00
33x4.....	7.00	35x5.....	8.50
34x4.....	7.50	36x5.....	9.00
35x4.....	7.75	37x5.....	10.00

All goods shipped promptly, \$1 deposit required with each tire ordered. Balance C. O. D., subject to examination, at the above prices without a guarantee. Get our prices on new tires.

ROYAL TIRE & SUPPLY CO.

Phone Calumet 2553

1461 Michigan Avenue

Chicago

SECONDS AT 50% OFF

—Non-Skid Only—No Mileage Guarantee—
30x3.....\$ 9.25 31x4.....\$18.30 34x4½.....\$26.80
30x3½.....11.75 32x4.....18.70 35x4½.....27.80
31x3½.....12.05 33x4.....19.60 36x4½.....28.25
32x3½.....13.75 34x4.....20.05 35x5.....32.65

10% Deposit Required, Balance C. O. D.

LAKESIDE RUBBER COMPANY
1412 Michigan Avenue Chicago, IllinoisHIGH GRADE
TIRES AND TUBESFactory Seconds, Unguaranteed, at Interesting
Prices. Also complete line of Firsts.

Write Us Your Needs

ACORN TIRE & REPAIR CO.
1547 So. Michigan Ave. CHICAGO, ILL.

Tires.
Magnetos and Service Stations.

Tires.
Radiator and Lamp Repairing.

TIRES & TUBES

TIRES AND TUBES—QUALITY ABOVE ALL
SLIGHTLY USED AND FACTORY REPAIRED

The QUALITY of our tires and tubes is superlative, the PRICE cannot be equaled and our SERVICE cannot be excelled.

A satisfied customer is our biggest asset, therefore we must satisfy you.

Size	Tires	Tubes	Size	Tires	Tubes	Size	Tires	Tubes
30x3.....	\$ 4.00	\$1.35	31x4.....	\$ 6.25	\$1.65	36x4½.....	\$ 8.75	\$1.85
30x3½.....	5.00	1.45	35x4.....	8.00	1.75	37x4½.....	9.25	1.90
31x3½.....	5.25	1.50	36x4.....	8.00	1.75	35x5.....	9.50	2.00
32x3½.....	5.50	1.50	34x4½.....	8.25	1.75	36x5.....	9.50	2.00
34x3½.....	6.00	1.60	35x4½.....	8.50	1.80	37x5.....	10.00	2.20

Send \$1.00 deposit with each tire ordered. Tires will be sent promptly C. O. D., with privilege of examination. Specify style of rim to avoid delay.

Our slightly used tires bear no mileage guarantee; but in the event that they do not give service in proportion to the price, you may return them to us by prepaid express and we will cheerfully make a fair adjustment.

We will accept junk tires at 5c per pound as part payment on orders, when same are shipped to us by PREPAID express.

LINCOLN TIRE & SUPPLY CO

1463 S. Michigan Ave.

Dept. M.

Chicago, Illinois

HIGH GRADE TIRES AND TUBES

BEST SECONDS ON THE MARKET

BEST VALUES ON THE MARKET

A Trial Order Will Convince You

Size	Plain	Tubes	Size	Plain	Tubes	Size	Plain	Tubes
28x3.....	\$ 7.50	\$2.00	31x4.....	\$15.00	\$3.20	34x4½.....	\$21.85	\$4.15
30x3.....	7.50	2.00	32x4.....	15.70	3.35	35x4½.....	22.85	4.20
30x3½.....	9.75	2.30	33x4.....	16.35	3.50	36x4½.....	23.50	4.30
31x3½.....	10.90	2.35	34x4.....	16.70	3.65	37x4½.....	24.75	4.60
32x3½.....	11.40	2.45	35x4.....	18.00	3.75	35x5.....	26.40	4.65
34x3½.....	13.25	2.70	36x4.....	18.40	3.85	37x5.....	27.75	4.95

Add 10 per cent to the above for non-skid tires. At the above prices without a guarantee. Order today. \$1.00 deposit required. Tires shipped by return express, subject to examination. Specify whether Q. D., Clincher or Straight Side Rim.

ARMSTRONG TIRE & VULCANIZING COMPANY

1336 MICHIGAN AVE., CHICAGO, ILL.

Branch: 1612 Michigan Ave.

Phones: Calumet 5212; Calumet 2199

STANDARD MAKE

Our quotations are based on old prices. Write before any further increases. Our stock consists of all makes of blemished, over-stock, close-outs, converted firsts, etc., with mileage guarantee removed, but warranted to give service and be fresh, clean tires.

Public Service Tire & Rubber Co. of N. Y. Inc.
1675 Broadway, New York City

TIRES

Forty to 60% off. New standard makes, surplus stock, unguaranteed. Ball bearings rebuilt, 50% off. Gasoline savers, 50% off. Write us.

AUTO ECONOMY CO.
223 West 49th Street
NEW YORK CITY

ELECTRIC REPAIR SERVICE

We represent eight factories.

ELECTRICAL TESTING CO.
PEORIA, ILL.

Expert Repair Service

ON EVERY KNOWN
MAGNETO IGNITION SYSTEM
GENERATOR ARMATURE WINDING
All Repairs Promptly Executed
All orders for repair parts shipped the day orders are received
AMERICA'S MOST COMPLETE
IGNITION, LIGHTING AND STARTING
INSTITUTION
PELLET MAGNETO CO.
Twenty-fifth and Wabash Avenue.
CHICAGO

RADIATORS

Get a Square Tube Radiator, 25% greater water capacity. Made for any car. New, guaranteed cores placed in old radiators. We also manufacture hoods, fenders, tanks and pans, and do guaranteed repair work. Prompt and satisfactory service.

CHICAGO MANUFACTURING CO.
1458-60-62-64 Michigan Avenue Chicago, Ill.

BRISKINS MUST DO BETTER

Otherwise six hundred of the finest central-states repairmen wouldn't be sending every radiator repair to Briskin. Why? Because they have found Briskin Service to be right; they get a square deal every time, month in and month out. Ask for folder.

BRISKIN MANUFACTURING CO.
Radiator Repair Experts
341 N. Capitol Avenue, Indianapolis

Pioneer

RADIATOR Manufacturers

Rebuilding, Repairing, and Manufacturing of Radiators for any make of car. Why send your Radiator down East when you can ship to us; save time, expense, freight, money, and be assured of expert workmanship? Our prices are right. We make new Radiators and allow for old ones.

TODD MANUFACTURING CO. Minneapolis, Minn.

When Writing to Advertisers, Please Mention Motor Age

Magnetos and Service Stations.
Radiator and Lamp Repairing.

IF IT'S ELECTRICAL WE CAN FIX IT

ANY STARTING, LIGHTING,
IGNITION SYSTEM

WE OFFICIALLY REPRESENT

BERLING MAGNETO CONNECTICUT
PHILBRIN BENDIX DRIVES
WESTINGHOUSE JESCO (Jones Starter)
K. W. IGNITION DYNETO
HEINZE SPRINGFIELD FORD STARTERS
VAN SICKLEN SPEEDOMETERS
WALTHAM SPEEDOMETERS
BRANFORD CARBURETOR

LET THE MAN WHO KNOWS
HANDLE YOUR REPAIR WORK

Arthur Jones Electric Co.

Established 1903
2837 S. STATE ST. CHICAGO, ILL.

OUR MODERN SHOP

IS AT YOUR SERVICE ON
Everything Electrical

Magnetos, Coils, Starter Motors,

Generators and Batteries

OFFICIAL REPRESENTATIVES FOR
Exide Batteries, U. S. L. Starting and
Lighting Systems

General Electric Tungar Rectifiers

MOTOR CAR SERVICE CO.

MAIN OFFICE
524-6 E. 35th St.
Phone—Douglas 1600

BRANCH
3911 Sheridan Rd.
Phone—Lakeview 7708

CHICAGO, ILL.

SEND IT TO DETROIT

FACTORY REPAIRS FOR YOUR ELECTRICAL STARTING, LIGHTING AND IGNITION EQUIPMENT

Our shop handles automobile factory work for the electrical manufacturers. Trained factory experts to repair and test your equipment. Complete parts stock insures prompt service.

Official Representatives & Service Station For

Bijur Berling Magnetos
Auto-Lite Connecticut Ignition
Dyneto K-W Ignition
Westinghouse Philbrin Ignition
Eclipse Bendix Norma Bearings
Tillotson Carburetors Atwater-Kent Ignition
Heinze-Springfield Ford Starters

Auto Electric & Service Corporation
11-13-15-17-19 Selden Avenue

SECOND HAND ELECTRIC MOTORS

We make a specialty of, and have the largest stock of SECOND HAND electric MOTORS and GENERATORS in America, and buy and sell, rent, exchange and repair electrical machinery of all kinds.

GREGORY ELECTRIC COMPANY
16th and Lincoln Streets CHICAGO

RADIATORS
Our Honeycomb Radiator

Embodies the following requisites of a perfect radiator:

STRENGTH COOLING POWER
NEATNESSIdeal for Passenger Cars, Trucks, Tractors
We specialize in repairing and recoring old radiators

Departments for manufacturing and repairing of everything in the automobile sheet metal line.

*We solicit your inquiries***Illinois Auto Sheet Metal Works**

Veteran Radiator Experts of the West

3200 S. MICHIGAN AVE. CHICAGO, ILL.

Radiators Properly Repaired

Do not spoil your radiator by trying to stop leaks with material that will eventually cause you to buy a new one. Send it to us, we will repair it and make it good as new.

*Quick Service***THE AUTO RADIATOR CO.**

401 Lincoln Way, East South Bend, Indiana

W(RIGHT) RADIATORS

Have stood the test for years—most durable and efficient. Get the best at less cost than others. Don't order until you send for our prices and illustrations of construction. Honeycomb and Bridge Pin Type (tubular). All standard makes in stock. Exceptionally low prices on Fords. Dealers' discount.

WRIGHT COOLER AND HOOD CO.

1253 Michigan Avenue Chicago, Ill.

RADIATORS REPAIRED PROPERLY

Anybody may attempt to repair your radiator. To succeed is another matter.

SEND IT TO DENVER**W. H. NEVEU, "The Radiator Man"**

Largest in the West. 1327-35 Broadway, Denver, Colo.

RADIATORS

We repair Radiators of all kinds—Any Make or Any Style

MITCHELL RADIATOR REPAIR COMPANY

933 Ft. Wayne Ave. Indianapolis Indiana

Buy and Sell Used Radiators

AUTO MAILING LIST

44,755 Auto dealers, U. S...\$75.00 or \$25.00 per M
 7,949 Ford Dealers, U. S... 18.50 or 3.00 per M
 5,519 Truck dealers, U. S... 12.00 or 3.00 per M
 (Showing make of truck handled)
 150,000 Truck owners..... 7.00 per M
 5,400 Truck owners in Chicago 15.00 or 3.50 per M
 46,943 Garage, U. S..... 75.00 or 2.50 per M
 55,967 Auto Supplies, Retail, U. S..... 90.00 or 2.50 per M
 45,054 Repair Shops 75.00 or 2.50 per M
 404 Auto Mfgs. 3.00
 73,674 Auto Dealers, Garages, Supplies and Repairs in one list, no duplicates125.00 or 2.50 per M
 1,502 Auto Supply Jobbers... 5.00
 Complete list auto owners and Ford owners, \$2.00 per M. Further particulars,
Trade Circular Addressing Co.
 166 W. Adams Street (Franklin 1182) Chicago

**Strictly Authentic, Up-to-Date
AUTO MAILING LISTS**

Any classification or combination from any state. All lists guaranteed. Lowest prices. Just let us know what you want and we will quote prices. Write for complete price list.

*Monthly Supplements***C. W. BYRD COMPANY**

713 First National Bank Building Durham North Carolina

FREE BOOKLET

"How to Succeed in the Automobile Business" on application. \$40,000 equipment—eight instructors—actual work repairing and driving—day and evening classes.

GREER COLLEGE OF AUTOMOBILE, TRACTOR & AEROPLANE ENGINEERING
1456 Wabash Avenue Chicago, Illinois**WE PAY CASH FOR PLATINUM SCRAP**

Mercury, contact points, old false teeth. Send us what you have for disposal, no matter how much or how little, and we will remit full market value by return mail.

THE MUTUAL SMELTING & REFINING CO.
54 South Front St. COLUMBUS, OHIO**Samuel L. Winternitz & Company
AUCTIONEERS***Largest Liquidators of Motor Plants***FIRST NAT. BANK BLDG. CHICAGO, ILL.****FOR SALE**

New outside Bowser Gasoline Storage Outfit with 5 bbl. tank. New style pump. Write for prices on anything you need in the garage line.

Address Box E-849, care of

MOTOR AGE**PATENTS**

Write for How to Obtain a Patent, list of Patent Buyers and Inventions Wanted. \$1,000,000 in prizes offered for inventions. Send sketch for free opinion as to patentability. Our Four Books sent Free. Patents advertised Free. We assist inventors to sell their inventions.

VICTOR J. EVANS & CO., 783 Ninth, Washington, D. C.**C. L. PARKER****Patent Attorney**

Formerly member Examining Corps, U. S. Patent Office, McGill Building, Washington, D. C.

Pamphlet of instruction sent upon request.

IDEAS WANTED

Manufacturers are writing for patents procured through me. Four books with list hundreds of inventions wanted sent free. I help you market your invention. Advice Free.

R. B. OWEN

77 Owen Building Washington, D. C.

FOR SALE

One forty H. P. Overland Motor in good condition with new cylinders and one Model K 30 Chalmers motor just overhauled with new cylinder block and rings.

JASPER MACHINE WORKS

Jasper Alabama

**CADILLAC MECHANIC
WANTED**

Expert Cadillac service man wanted in a Mississippi River Valley town of fifteen thousand. Give experience and wages required. Address

Box E-853, Care of MOTOR AGE

**The "Real" Beginning of Many
a Firm**

is reckoned from the date of their first advertising in these columns. If you need more business, we may have an inspiring story from someone in your line.

*Ask us how it was done***CLASSIFIED ADVERTISING
DEPARTMENTS****Motor Age, Mallers Bldg., Chicago****Who Will Be the
Assistant Superintendent of Our
Airplane Engine
Plant?***The place demands a MAN. He must be a two-fisted he man who can do things better than anyone else has done them. The place requires a man with extensive factory or production experience. He must be an all around man and able to grow into the methods of tomorrow which must be used today to lick the Hun.**A big broad gauge man who has been superintendent or factory manager of some automobile or similar production plant, who has solved problems on his own initiative, is the type who would qualify best for this important Government work.**Our plant is as modern as tomorrow. Its equipment and tools are unsurpassed. The organization backs the doer of things and offers him whole souled co-operation.**The only limit to the salary is the ability of the man to produce the best airplane engines in the shortest space of time.**Come and help us: come and help the Government: come and help our fighters in France and on the Sea.***HELP US HURRY**

Address Box E852

Care of Motor Age

Help Wanted.

Help Wanted.

Tool & Jig Designing Engineer on Airplane Engine Work

Here is a great big opportunity for some man with a lot of shop experience and technical training. Many a go-getter has been looking for this sort of a place.

Here is your chance to hook up with the production of airplane engines.

He must be a man who has the practical experience in shop work as well as technical knowledge and experience necessary to manage and direct a large force of tool and jig draftsmen. A man who can meet emergencies, can think for himself and has initiative is the sort who will qualify.

This place will pay sufficient to warrant the best men in the country fighting for it. Here is your chance to help defeat the Hun by joining the fighting workers and making airplane engines for our fighters in France and on the sea. Call or write Nordyke & Marmon, Indianapolis, Ind.

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ADVERTISERS IN THIS SECTION HAVE FACILITIES AT THEIR DISPOSAL TO TAKE ON ADDITIONAL WORK ON CONTRACT. AUTOMOBILE SPECIALTIES OF ALL KINDS MANUFACTURED ON CONTRACT BASIS. SPECIAL MACHINERY, PRESS WORK, AUTO MACHINE WORK, FOUNDRY WORK, AUTOMATIC SCREW MACHINE WORK.

—WANTED—

Metal Stamping and Punch Press Work
STANDARD METAL MFG. COMPANY
Chestnut, Jefferson & Malvern Sts.
NEWARK NEW JERSEY

GENERAL FOREMAN**Machine Department Automobile Plant**

Here is a chance for a man with a lot of fine, general shop experience, knowledge and ability to become General Foreman of the Machine Department of the Automobile Section of our plant.

The man must know how to meet emergencies, must have plenty of ability and be a go-getter in every sense of the word. This is a big opportunity for the right man and the best man wins. Prove your record in your first letter. Address Box E-851, care of Motor Age.

DIE CASTINGS

Equipped for large output of highest grade Die-Castings. Send us samples or blue-prints of your most accurate and intricate parts from which we will gladly quote prices in quantities. Illustrated catalog sent on request.

ALEMITE METALS COMPANY
341-351 West Chicago Avenue, Chicago, Illinois

METAL STAMPINGS, JIGS, DIES,
GAGES, SPECIAL TOOLS, ETC.
KRASBERG MFG. CO.
536 LAKE SHORE DRIVE CHICAGO
Opp. Municipal Pier

The Cell-Beam Concealed Searchlight

Throws concentrated beam of light 500 feet. Weighs less than a pound, measures 5½" over all. Fits into door pocket or attaches with a clip instrument board or dash. Price \$5.00 complete. Dealers, write for proposition.

The Cell-Beam Corp. 501 Fifth Ave., New York City



Inner armor
for automo-
bile tires.

INSYDE TYRES

Prevent punctures and blow-outs. Double mileage of any tire, old or new. Easily applied without tools. Used over and over in several tires. Will not heat or pinch. Cheaper and better than double treads, etc. Details free. Distributors and agents wanted. Sales guaranteed.

AMERICAN ACCESSORIES CO. 250 Gulow St., Cincinnati, Ohio

BETHLEHEM MOTOR TRUCKS

"DEPENDABLE DELIVERY"

1¼ TON CHASSIS, \$1295

2¼ TON CHASSIS, \$1915

All F. O. B. Allentown

Built to dominate the truck business in your territory—backed by the Bethlehem guarantee and a strong national advertising campaign. Is your territory covered?

BETHLEHEM MOTORS CORP., Allentown, Pennsylvania

CONTRACT WORK DEPARTMENT

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**You will save time and money
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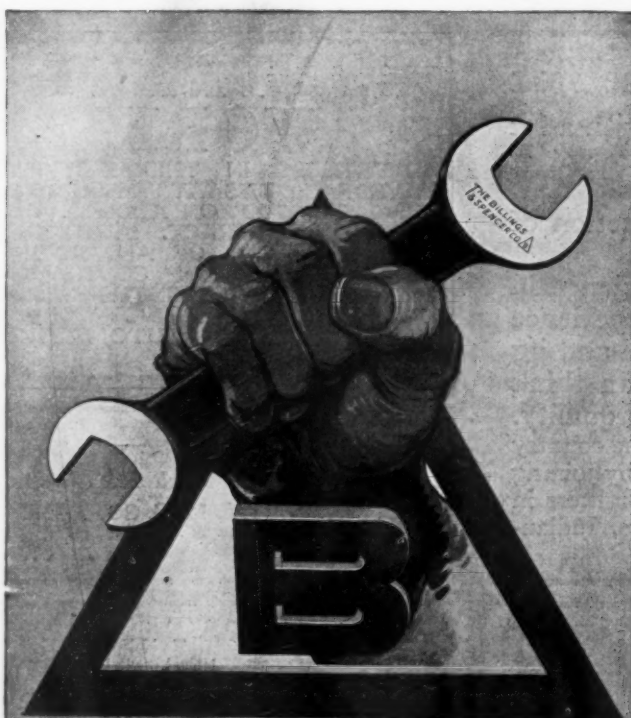
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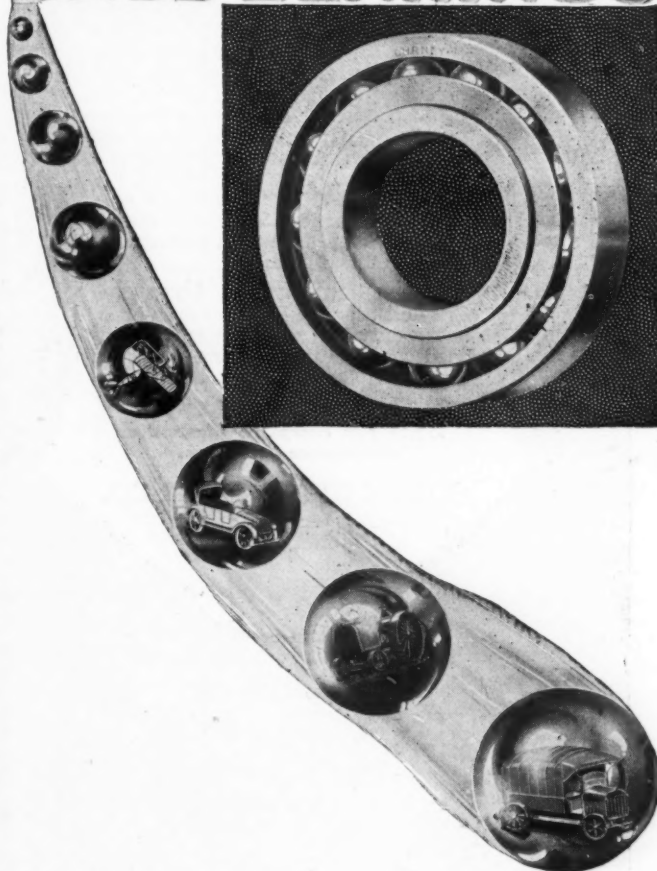
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This means one bearing in place of two without sacrificing the factor of safety.

Gurney Ball Bearings carry heavier loads, because of the peculiar method of assembling, which permits more balls and larger balls.

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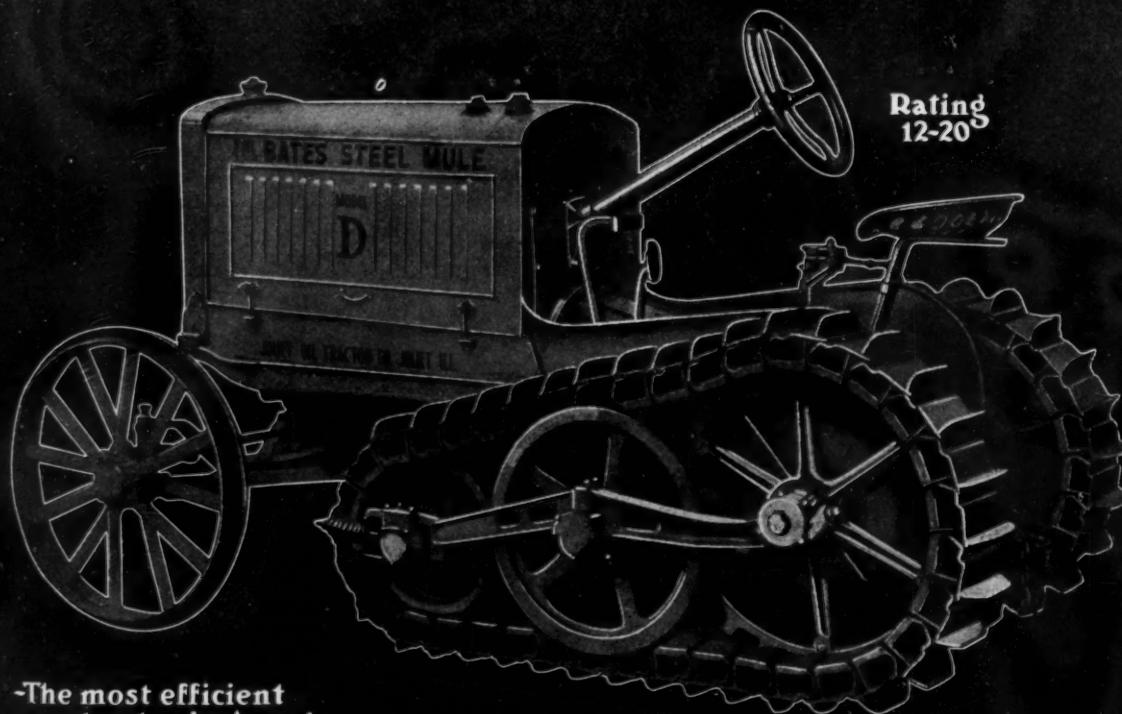
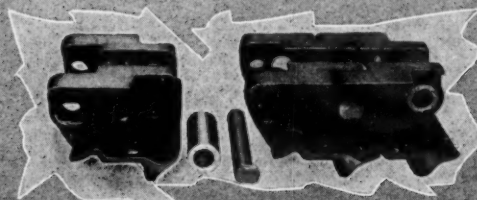
Correct mechanical principles combined with the proper alloy steels, specially heat treated for this hard service, make the BATES STEEL MULE Crawler Shoes endure the life-time of the tractor. The knowledge of what these materials must be and how they must be heat-treated has become known to its builders only through the experience gained during the past six years with thousands of tractors in the field.

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RINGS

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PISTON RINGS

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